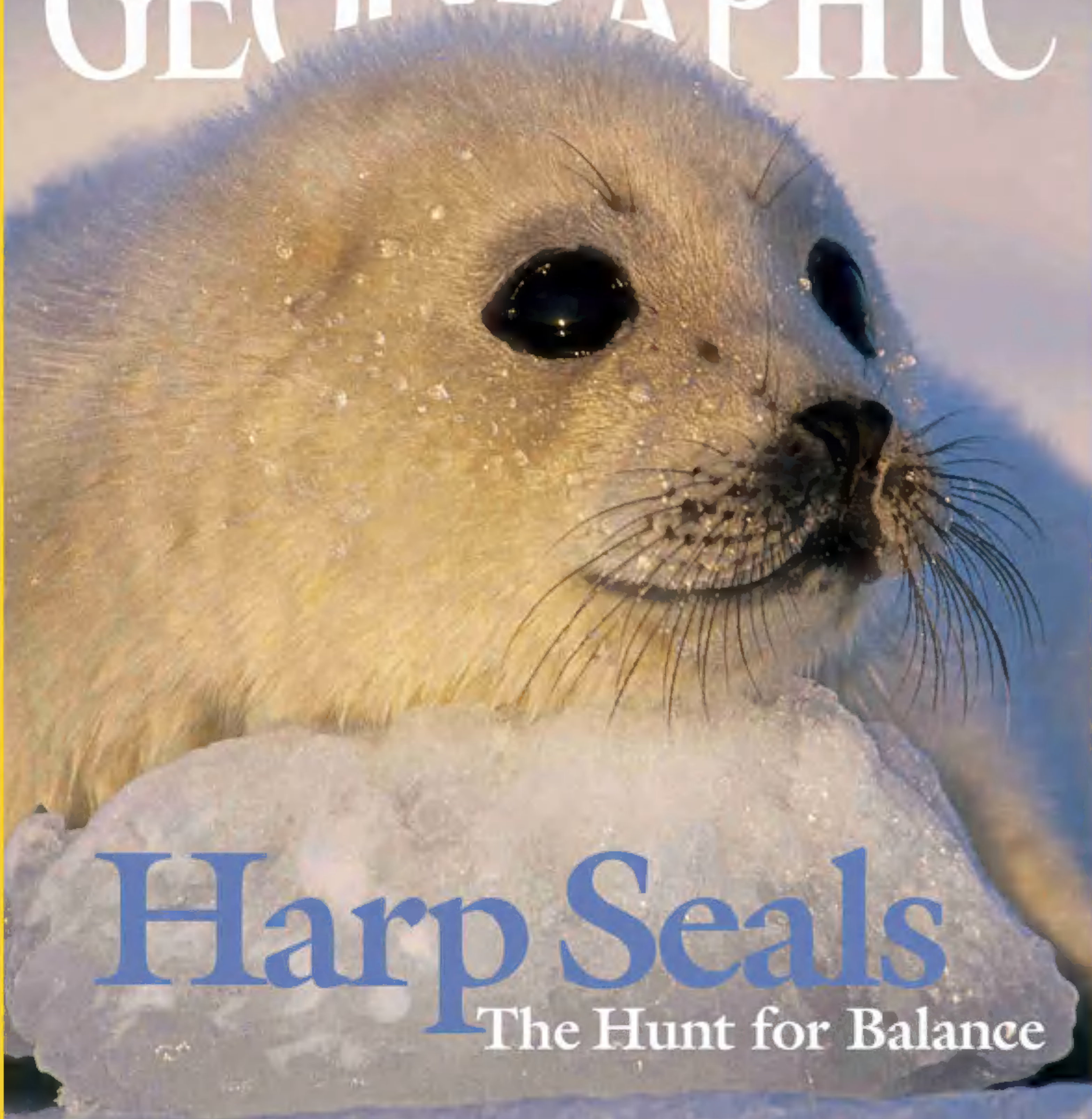


NATIONALGEOGRAPHIC.COM/MAGAZINE

MARCH 2004

# NATIONAL GEOGRAPHIC



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The Hunt for Balance

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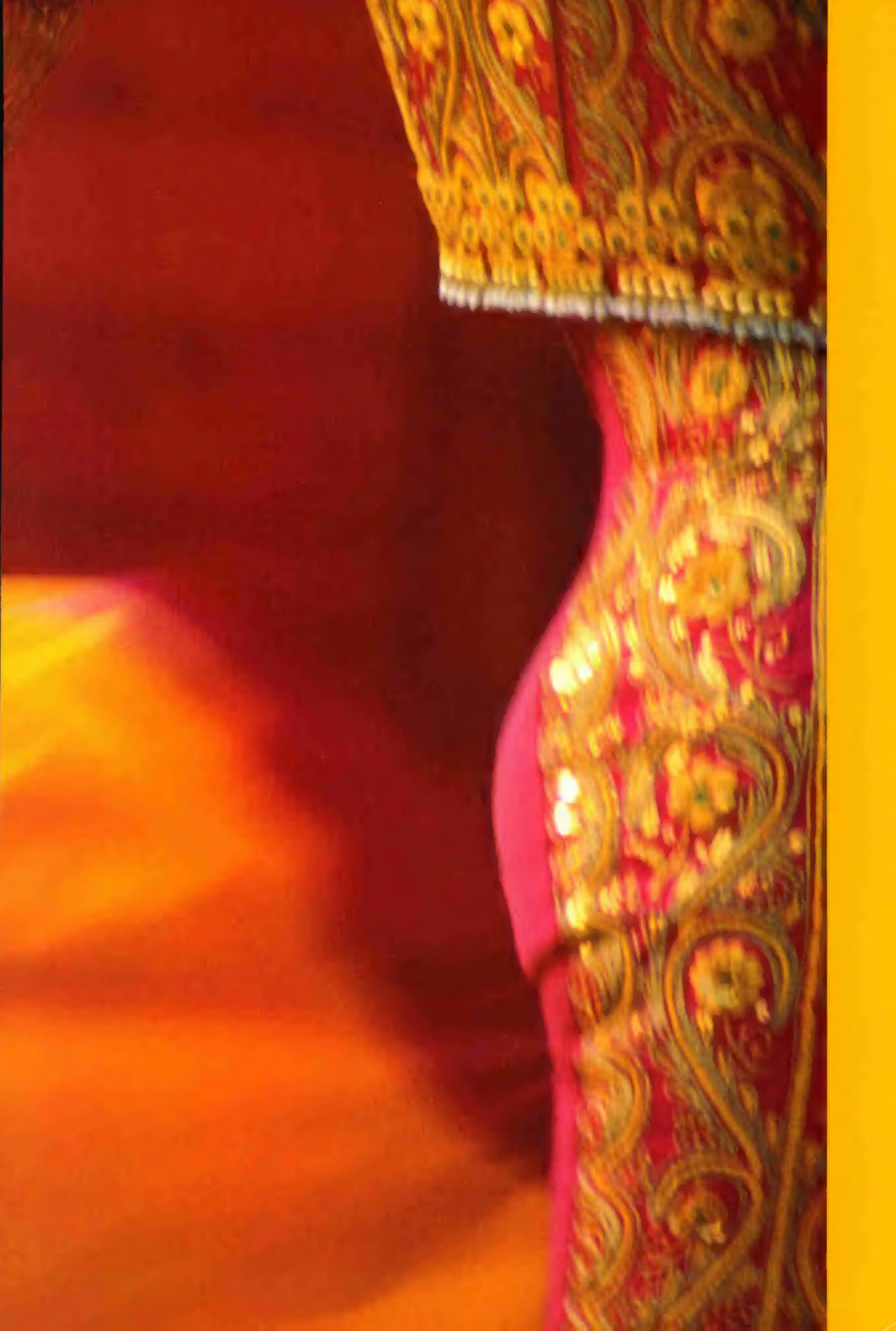
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### THE COVER

A harp seal pup hugs the ice in Canada's Gulf of St. Lawrence.

BY BRIAN SKERRY

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When banded mongoose pups make their first forays into the Ugandan bush, filmmakers Chris and Martin Kratt are there as the newborns learn to cope with life. From Chris's close-up look (left) at an insect-hunting lesson to a pup's close call with a hungry monitor lizard, the show offers encounters with all kinds of creatures.



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### HARP SEALS

**VIDEO INTERVIEW** Photographer Brian Skerry talks about the relationship between mother seals and their pups and the threats facing them. ■ **PHOTO GALLERY** See more seals at [nationalgeographic.com/magazine/0403](http://nationalgeographic.com/magazine/0403).

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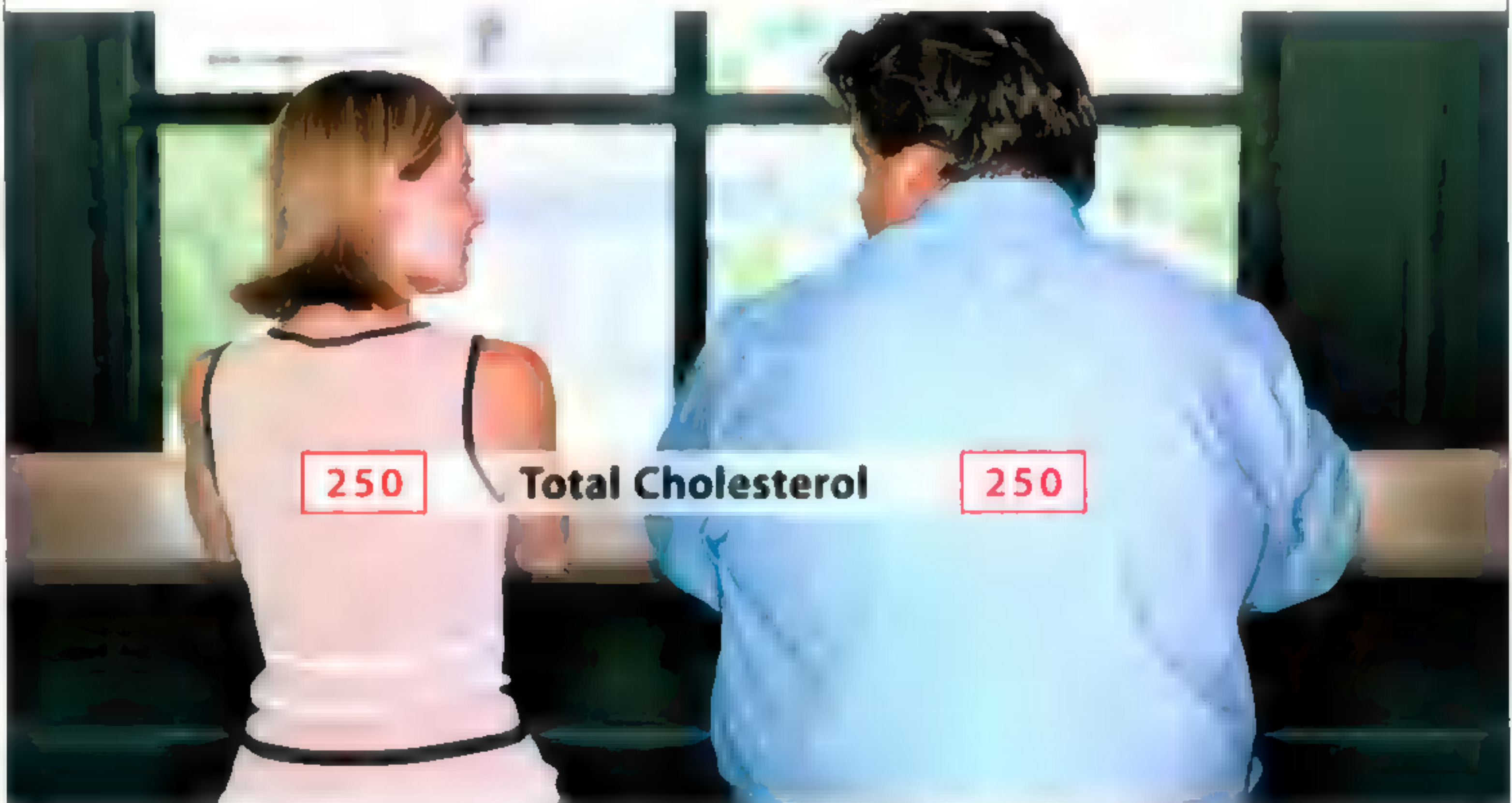
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*Please see additional important information on next page.*





## We found our best watch in a history book

In 1922, a small watchmaker in Switzerland patented the first automatic watch to display the day, month and date. Only 7 of these magnificent timepieces were ever made and this watch was almost lost to history. Today, they are so rare that one original chronograph watch would probably fetch more than \$300,000 at auction.

These watches were among the most stylish of the roaring 20's. And yet no one has attempted to remake this 1922 classic until now. The Stauer watch design that you see here has been painstakingly recreated from the original functions to please even the most discerning owner. The owner of this classic chronograph watch is sure to look distinguished and set apart from the crowd. From the sweeping second

hand to the Roman numerals on the unique ivory-colored face, every detail has been carefully reproduced. This Stauer reissue is a limited series, allowing you to wear a watch far more exclusive than many Rolex, Movado, TAG Heuer or Breitling watches.

The watch has a 21-jewel mechanical movement, the kind desired by fine watch collectors. We have updated this movement with kinetic power thus the watch never needs to be manually wound. The watch comes in a beautiful case and comes with both interchangeable black and brown leather bands.

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# From the Editor



BOB SACHA

**It's time to rethink China.** If you still imagine China as a quaint, agricultural land with only bicycles and hand-drawn delivery carts—the place conjured up by the picture above—then prepare yourself for a different view.

This month we show you a brash, industrial China, where sleek cars, luxury high-rises, and countless export factories are overshadowing the preindustrial past. But rising affluence isn't the only angle to report. Some effects of change on China's people and environment have been devastating. The central government in Beijing, to its credit, has responded by taking steps to limit pollution and restore damaged lands.

Odds are you don't live in China, so you may not think that China's struggle to balance wealth and environment matters to you. It does. Here's an example: Every March, storms sweep across degraded Chinese farmlands, creating a dust cloud spiked with pollutants from cities. In 2001 that toxic cloud made it all the way to Maine. Another worrying trend for people around the world is China's greenhouse gas emissions, which could exceed those of the United States within a few decades.

In light of China's population, Earth's largest at 1.3 billion, and its economy, the fastest growing, it's not a stretch to say: As China's environmental fortunes go, so go the world's.

*Bill Allen*

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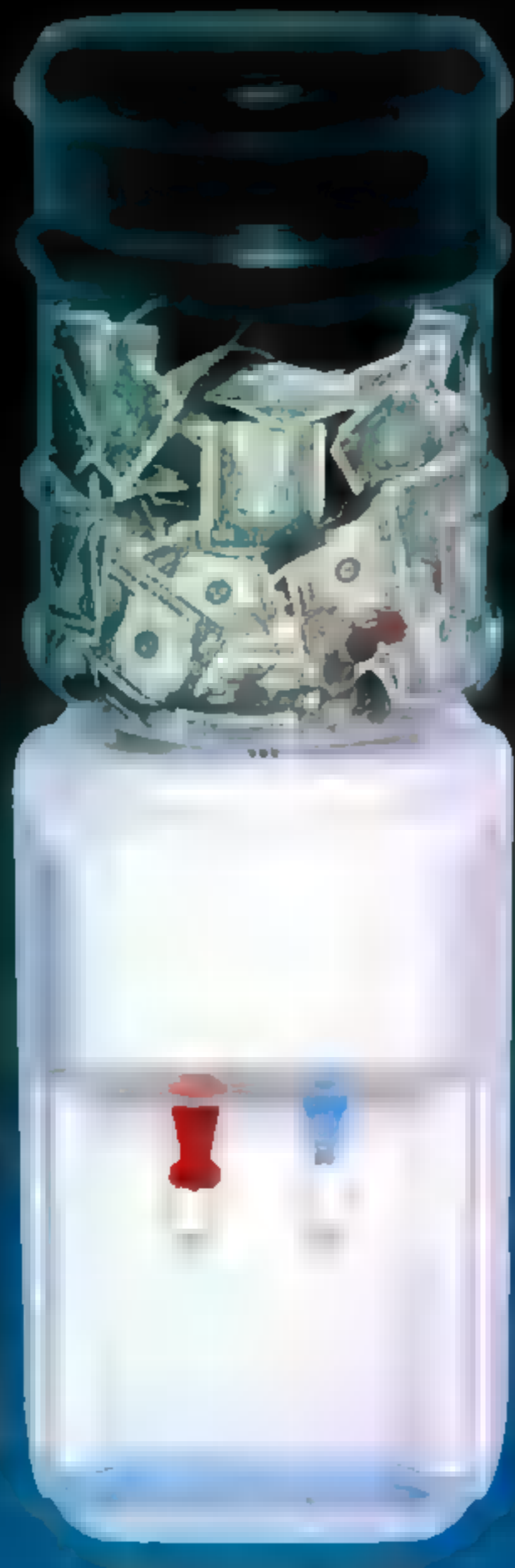
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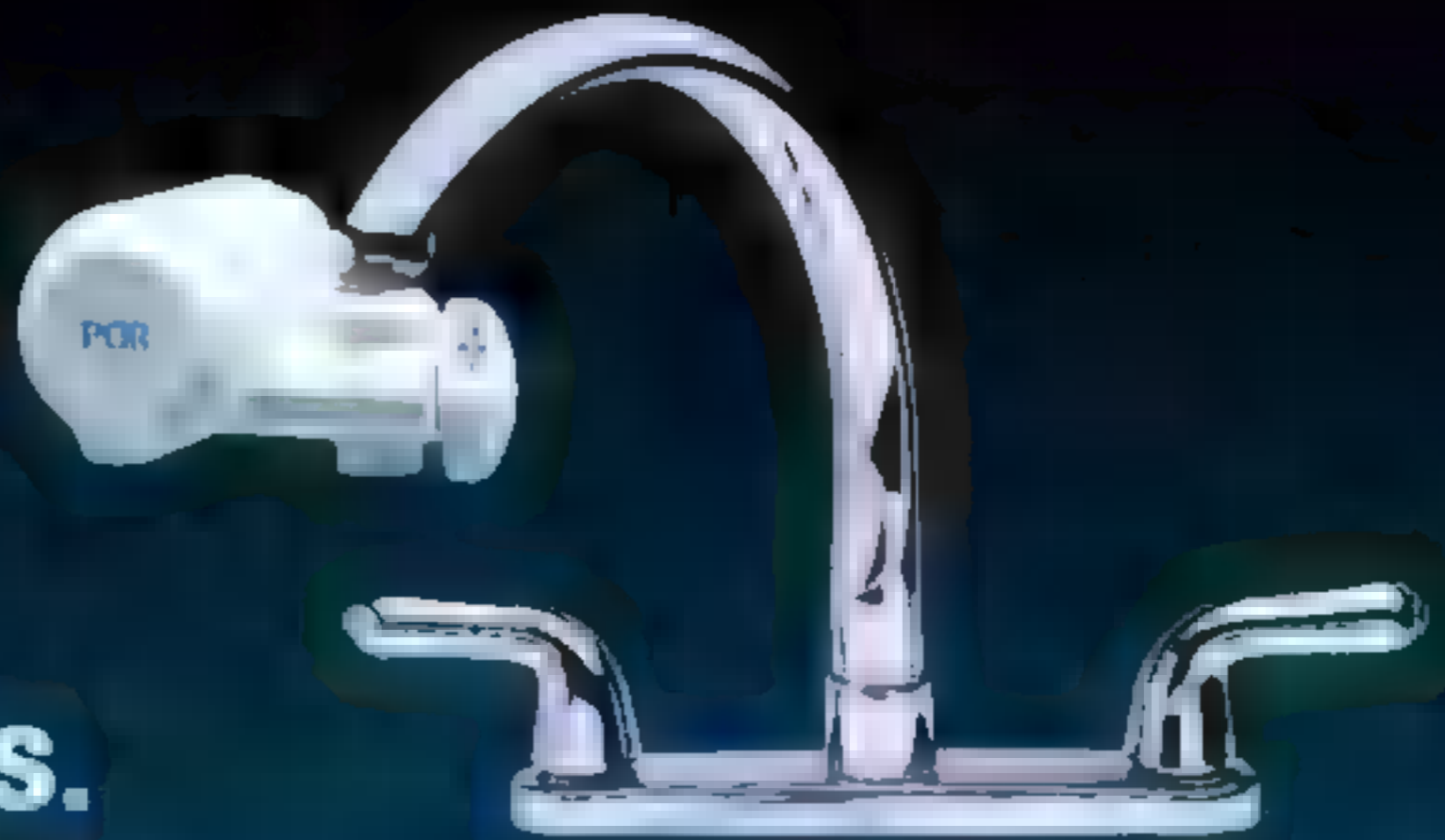
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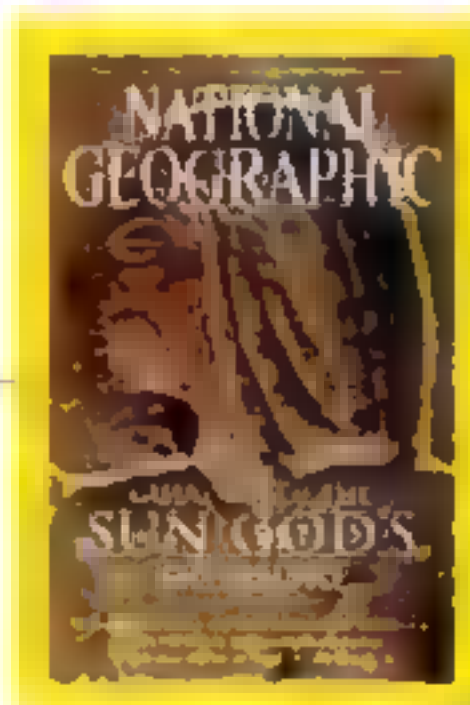


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# Forum



## November 2003

"Watching You," the story on surveillance technology, provoked the most mail. One reader complained that it should have been the cover story. It was—but only on some magazines. Although all members received issues with an ancient Egyptian relief on the cover (above left), newsstand buyers in North America saw two different covers: either the Egyptian relief or a glaring eye (above right). Early numbers show the surveillance cover faring better.

## Watching You

I would rather take my chances with terrorists and robbers than be monitored and analyzed by anyone—be it my boss or the government. Wake up, people; our freedom is at stake!

CATHLEEN MCGOWAN  
Zion, Illinois

I have no big problems with modern surveillance, as long as people's rights are not violated. Many people feel it's wrong for the government to watch them, but as soon as their lives are saved by modern-day surveillance, I think their opinions will change.

OWEN TOMLINSON  
Exeter, Devon

FROM OUR ONLINE FORUM  
[nationalgeographic.com/ngm/0311](http://nationalgeographic.com/ngm/0311)

Your magazine has done the U.S. a great service. People need to be

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awakened to the dangers inherent in the federal government knowing everything. It may well be that these changes are not being instituted by despots but rather by misguided patriots in the name of liberty, safety, and security. However, what is to prevent a despot in 20 or 50 years from using the system to institute a dictatorship? George Orwell and Robert Heinlein both have given us possible scenarios. Can it be that American citizens have forgotten the words of Benjamin Franklin, now more than 200 years old, but still valid: "They that can give up essential liberty to obtain a little temporary safety deserve neither liberty nor safety."

FRED BUSHNELL  
Pfalzgrafeweiler, Germany

Those who complain about a violation of "privacy rights" in the video surveillance of public places need to get their terminology straight. A public place is not, per se, private. What they are really complaining about is a lack of anonymity. Most people would agree that being anonymous in public is much less important than true privacy.

KEN SIMON  
Grosse Ile, Michigan



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### Yellowstone and Grand Teton National Parks

From the moment I saw the magnificent photos and began to read the stirring words of Alexandra Fuller, I was transported to another world. I have never been drawn so quickly and deeply into a NATIONAL GEOGRAPHIC article. Thank you for transforming a few minutes of my life.

MIKE CAUSEY  
*Abingdon, Oxfordshire*

My heart sank when I read the caption accompanying the photo of snowmobilers [above], which referred to critics who believe that snowmobiles "destroy" Yellowstone and Grand Teton. I am a snowmobiler, and there is nothing I enjoy more than going out in the snow and taking in the rugged beauty of the winter wilderness.



JOSE AZEL

As long as snowmobilers follow the rules concerning where they can and cannot go, it seems to me that the only destruction that snowmobiles might cause would be due to exhaust emissions. Cleaner, quieter snowmobiles can be rented at these parks. As stated in the article, Congress declared

Yellowstone be set aside "for the benefit and enjoyment of the people." Maybe critics of snowmobiles would prefer it be set aside for an elite few.

HENRY WHITE  
*Stephenville, Newfoundland*

Reality in Yellowstone National Park is the high, whining noise of snowmobiles, which chills my blood. My earplugs have proved useless against this intrusion. I wonder what all this noise pollution does to wildlife? To keep my sanity, I stay home and look at glossy pictures of the winter wonderland.

ATHENA BARSIS  
*Ogden, Utah*

*As we went to press, a federal judge ruled that a Clinton Administration plan to ban snowmobiles from the parks must be revived.*

Today's surveillance technology is scary indeed. If it had been available when people fled East Germany—hidden away in trucks, tied under cars, or tunneling under the wall—few people would have made it to the West. There is no question in my mind that this technology will be used by the few to keep the many in check (and don't think it couldn't be in the United States). Then we will have neither security nor freedom.

KARIN OVERBECK  
*Deer Park, Washington*

Your article filled me with disdain for those who would accept that their government had their best interests in mind while recording their every movement and utterance. No society priding itself on the ideals of liberty should ever allow its government the tools to enslave it; in such a society it is the task of the citizenry to police its government, not the other way around.

ADAM B. KEITH  
*Fresno, California*

### Burma Road

I've waited 60 years for you to cover the construction of the Ledo Road, an engineering feat once declared impossible. I was an officer in the 1304th Engineering Construction Battalion. With very limited equipment we built every pile-driven bridge from Ledo to Myitkyina. Chinese

troops were brought in to cut down trees and hand-hew them into 12-inch-by-12-inch timbers. We used elephants brought in from India to drag the timbers to the bridge site. Using a portable generator, we worked day and night. We lived like gypsies and moved our camps from bridge to bridge—often before any road was available.

WILLARD STRONKS  
*Holland, Michigan*

The Burma Road does not end at the reconstructed West Gate of Kunming; its legacy extends halfway around the world to the highways and byways of America. My uncle honed his skills as a surveyor on the Burma Road with the Survey Platoon 653rd Engineer Battalion. He then returned to Scranton, Pennsylvania, to start a career as a surveyor.

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Travel down the Northeast Extension of the Pennsylvania Turnpike or Interstate 81 between Scranton and Harrisburg, two projects my uncle worked on after the war, and in a sense you are traveling the Burma Road. The ingenuity and talent that built one roadway came back to the States to build the others.

TIMOTHY B. McGRATH  
*Bethesda, Maryland*

### Afghanistan

I was very disappointed when I saw pictures of the Afghan women. It was my understanding that overthrowing the Taliban was about giving women more freedom. These pictures show that very little has changed. Being stuffed in the trunk of a taxi is degrading. Apparently women are still nothing more than chattel.

K. E. HOOVER  
*Clifton, Colorado*

*Despite efforts by some international and Afghan organizations, life for women in Afghanistan has changed little. A new constitution, however, grants equal rights and a number of parliament seats to women.*

Who is the beautiful child on page 37? She looks like my daughter. I have looked at pictures in NATIONAL GEOGRAPHIC for years, but this photo has moved me to my core. Is this little girl homeless? Is there any way to help?

DEB SANFORD  
*Orange, Virginia*

*We don't know the girl's identity or circumstances. You can help young women and girls in Afghanistan through National Geographic Society's Afghan Girls*

*Fund. For more information go to [nationalgeographic.com/help/education.html](http://nationalgeographic.com/help/education.html).*

### Cuba Naturally

Thank you for bringing back a piece of my Cuba to me. I left the island in December 1956 and have yearned for its mountains, valleys, beaches, and *ciénagas* (swamps) ever since. Never mind

**I would rather  
take my chances  
with terrorists  
and robbers than  
be monitored  
and analyzed by  
anyone—be  
it my boss or the  
government.**

the politics—you brought back what counts. Santiago de Cuba will always be in my heart.

MERCEDES LORING  
*San Rafael, California*

I'm appalled that NATIONAL GEOGRAPHIC would publish such a propagandistic article. It misleadingly makes Cuba seem like a wonderful environmental haven cared for by an environmentally conscientious government, when in fact it is the Castro government that has destroyed Cuba's environment.

RAY SANDOVAR  
*New York, New York*

FROM OUR ONLINE FORUM  
[nationalgeographic.com/ngm/0311](http://nationalgeographic.com/ngm/0311)

### ZipUSA: Fargo, North Dakota

When I read the feature on 58102, all I could do was sigh. The article perpetuated the stereotype of Fargo as always cold. One picture showed a vast, cold, windswept vista. Statistics highlighted the lowest temperature and the number of snowplows. You titled the article "The Fargo That Wasn't in the Movie," so why not, in the interest of fairness, at least acknowledge that there are other seasons here in Fargo? How about revealing the highest temperature and the number of flowers planted in the parks every spring?

HELEN LEVITT  
*Fargo, North Dakota*

### Behind the Scenes

The picture of an aurora borealis taken from space is lovely, but what is the white ring at the bottom of the photo?

FRANK STALEGO  
*Fernandina Beach, Florida*

*The photograph, taken by astronaut Don Pettit, shows Lake Manicouagan, a feature of a meteorite impact crater in north-eastern Canada, illuminated by moonlight.*

### The Sun God's Treasurer

I just received the November issue and was annoyed to find yet another Egyptian tomb photograph on the cover and a feature article on the subject. You have too many articles on ancient Egypt. Give it a rest!

CAROL FREDERICKS  
*Fresno, California*

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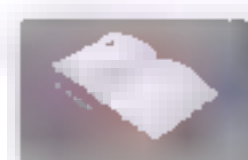
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# GEOGR

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FORENSIC SCIENCE

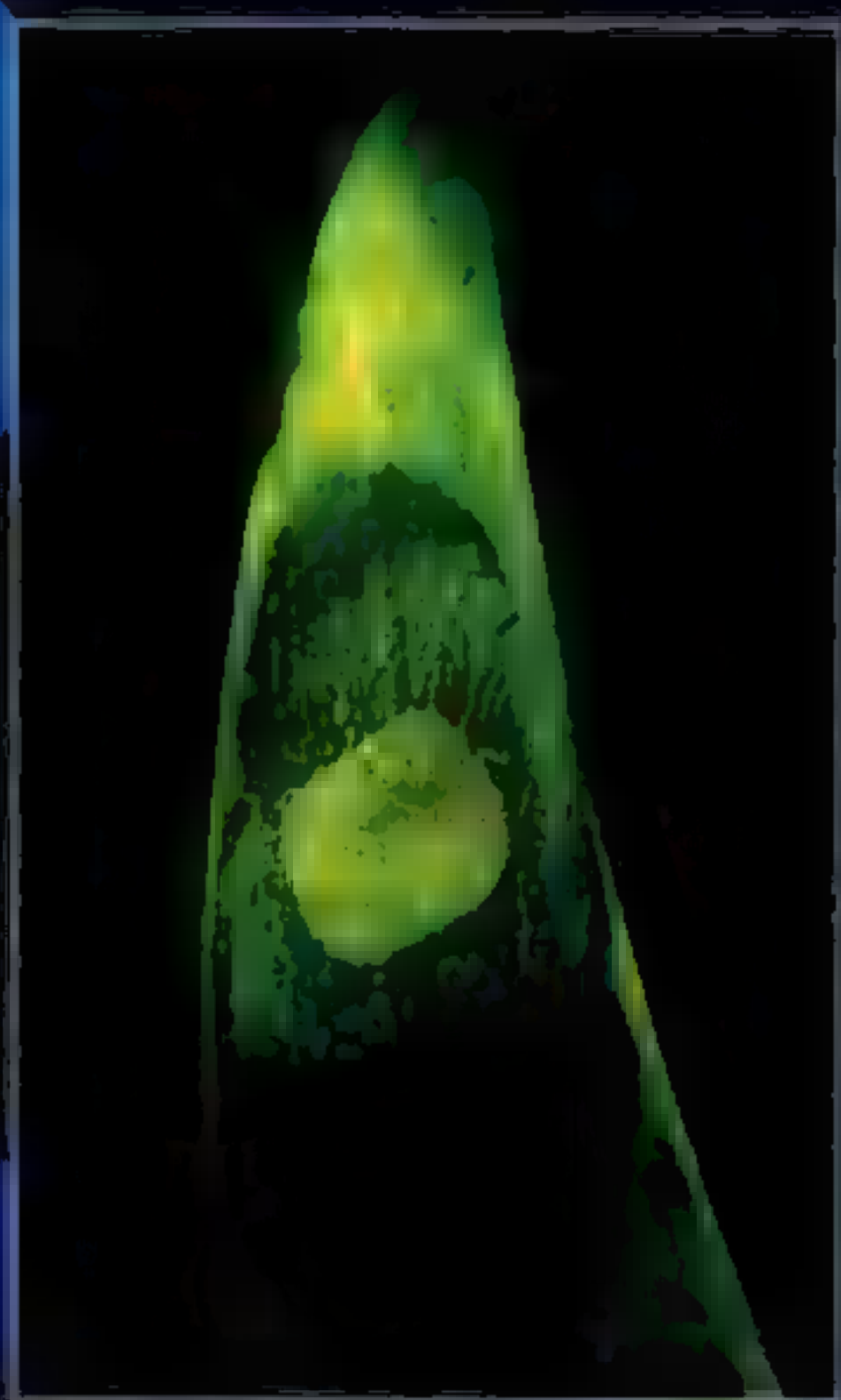
## Murder Most Beastly

*Inside the world's only animal crime lab*

A moose carcass, an eagle wing, a jar of caviar, the gallbladder of a black bear. It almost sounds like a recipe for some diabolical witches' brew. Actually it's murder evidence, carefully bagged and tagged, and it's all stored in the walk-in freezer at the National Fish and Wildlife Agency's forensics lab in Ashland, Oregon, the only lab of its kind in the world. Without the lab's help, the statutes that protect endangered or threatened animals worldwide would have, well, no teeth.

"We're fortunate in the U.S. to have a crime lab dedicated to animals," says Edgard Espinoza, deputy director of the lab and its chief forensic scientist. "Most countries can't afford this type of facility."

The lab never lacks for work. "The illegal wildlife trade probably second only to the drug trade," says Fish and Wildlife agent Tim Santel. In a typical year the lab's 23 scientists analyze more than 5,500 items—from animal carcasses to boots made of crocodile leather. Here,



DAVID McCLARY (BOTH)

technician dusts a mounted rhino head with magnetic fluorescent powder, revealing a clear fingerprint on the horn (inset).

A pioneer in the science of wildlife forensics, the animal lab often uses DNA analysis in its work. Among other innovations, its genetics team has developed a technique to identify the DNA of 14 species of sturgeon and paddlefish whose eggs are



# APHICA

CREATURES OF OUR UNIVERSE





DAVID MELAIN/BOH

packaged as caviar. With backup from the lab, agents run sting operations to catch traffickers in illegally harvested or fraudulently marketed fish eggs. In one case perpetrators were hit with a 10.4-million-dollar fine, the largest fine ever imposed in a wildlife crime case.

The lab also used DNA to help make a case against a butcher shop in Illinois accused of selling tiger meat. The meat was labeled as lion, which is legal to sell in the U.S. (tigers are endangered, lions are not), but DNA tests revealed that it was tiger.

Over the past decade there's been a boom in the import of exotic animal parts that immigrant communities in the U.S. traditionally use in ceremonies or for medicinal purposes. African bush meat such as monkey, eaten during rituals, fetches high prices on the black market. To help identify meat from primates—animals known to carry HIV and other deadly microbes—lab technicians collected DNA samples from the paws of monkeys and apes that lived and died in zoos (above). The resulting DNA catalog provides a ready reference to help solve future cases.

Black bears have fallen prey to

hunters hoping to cash in on the market for bear gallbladders, which are prized in Asia for treating a host of ills, from liver disease to hemorrhoids. Hunters typically remove only the gallbladder and leave the rest of the bear—ample evidence for the lab to link a culprit to the crime.

Often agents get a tip from informants that, for instance, a hunter has made an illegal kill in a national park. The agents locate the kill and any shell casings left behind (below, shown with a confiscated illegally imported polar bear skin), then ship any remains containing bullets to the lab, where ballistics

analysis can lead to the killer.

Agents working undercover to snare offenders can find themselves in dicey situations, particularly with cash stakes so high (list below). One agent posing as a hauler of lions and tigers had to watch as his contacts shot the big cats: Unarmed himself, he could have been their next victim. But he managed to get evidence critical to breaking up the criminal ring. "We realize there are dangers in what we do," says agent Santel. "But because of the passion we have for our work, we don't think about it, we just do it."

—David Diamond

## Big-Ticket Animalia

**\$175,000** Paid for an albino arowana fish, believed in Asia to bring good luck.

**\$60,000** Cost in Yemen for a kilo of black rhino horn, used to make ceremonial daggers.

**\$30,000** Price on U.S. black market for a live Komodo dragon.

**\$30,000** Paid in Asia for the carcass of a Siberian tiger.

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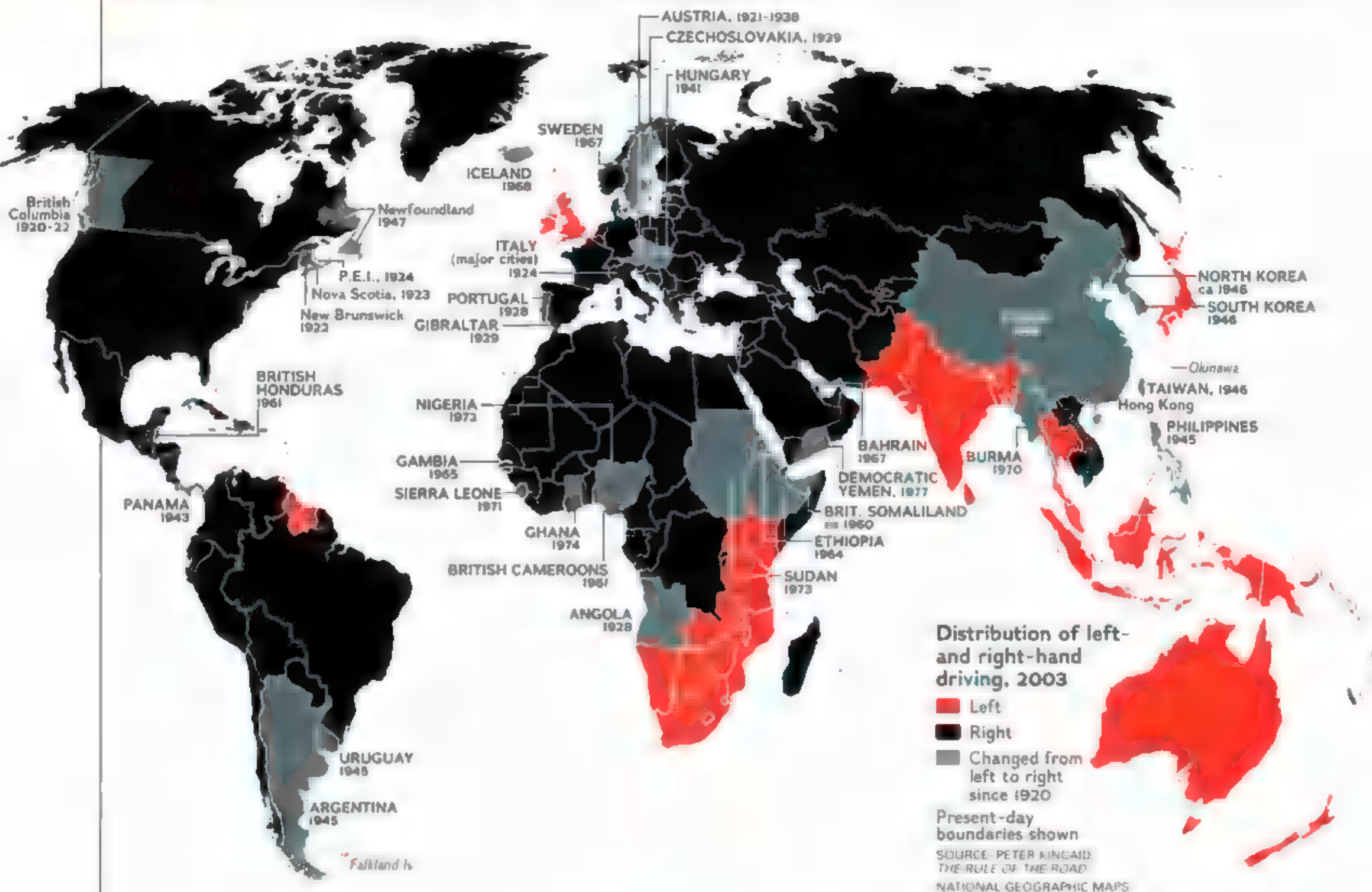
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THE GEOGRAPHY OF EVERYDAY LIFE



## Right (or Left) of Way

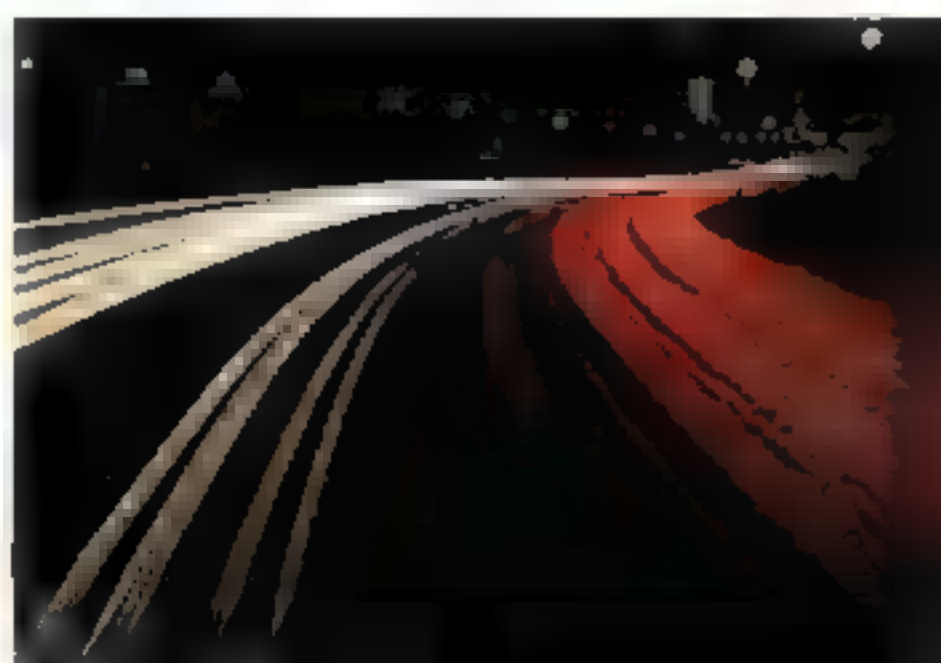
The British Empire may have waned, but the sun never sets on one leftover of colonial rule. Take Hong Kong, for instance. Even though Britain returned the crown colony to China seven years ago, Hong Kongers still motor down Queensway the way the Queen would—on the left—while the rest of China drives right, as does about 70 percent of the world.

In bygone days, English cavaliers kept left so they could draw swords with their right hand to fend off approaching highwaymen. In France and the 13 Colonies, teamsters steering heavy wagons pulled by six horses rode the left-rear horse and drove on the right

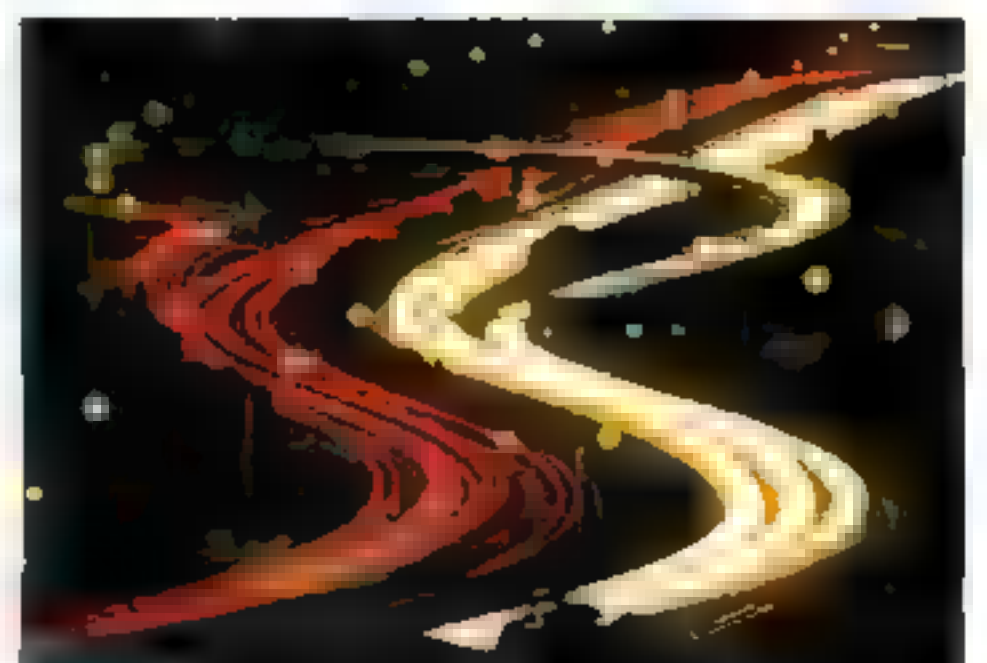
to judge clearance when meeting an oncoming wagon. Practices like these shaped regional rules of the road, and by the time cars drove onto the scene, nations had chosen sides. The Nazis ended leftist driving in central Europe in the 1930s and '40s, and in 1982 Argentine invaders forced Falkland Islanders to drive on the right—until British troops landed and redirected traffic.

As global travel and commerce boomed in the 20th century, some left-leaning countries in Latin America and Africa changed sides.

Sweden, the last leftist holdout on the European continent, switched in 1967. But in 1978 Okinawa went the other way. Perhaps to erase a reminder of the 27-year postwar U.S. occupation, Japan ordered left-side driving restored on the island, putting it back in sync with the rest of the country. Cost in today's dollars: nearly a quarter billion. Why pay the heavy toll? "It's a powerful statement of who's in charge," says roads scholar Peter Kincaid. "The rule of the road is part of national identity." —Scott Elder



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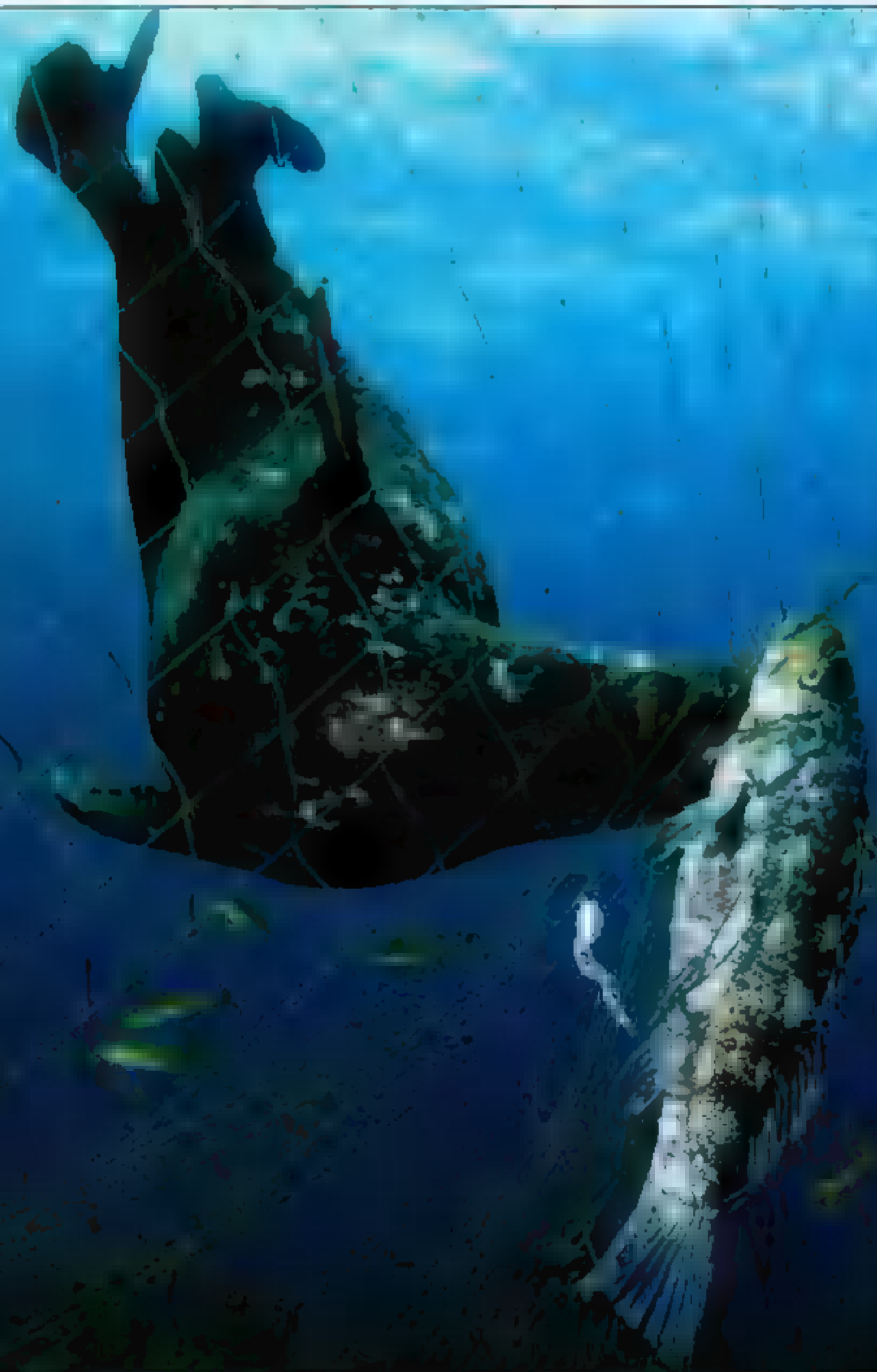
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## CONSERVATION

## Net Gain—And Loss

Swimming under a gill net in a harbor, a fisherman's net is a harbor sea diver's "amazing discovery," says photographer Brian Skerry, who caught the thief red-handed in this image taken off Baja California. Yet marine mammals, sea turtles, and other ocean life often drown in such nets. Last fall divers in these waters happened on another gill net. In it were ensnared five sea lions, a shark, and a cormorant, all of them dead or nearly so. Gill nets are banned along much of California's coast but not along Mexico's Pacific shores.

—John L. Eliot

BRIAN SKERRY

## ODD JOBS

## Cigar Lectors

Once a proud tradition, now a dying profession, cigar lectors—*lectores* in Spanish (right, background)—entertained generations of workers as they sorted, cut, and rolled tobacco leaves into cigars. Lectors disappeared from Florida's cigar industry in 1931, but some, such as the woman profiled below, persist in Cuba.

**Name and age:** Yuneimis Miló González, 24

**Job:** Reading to cigar workers

**Workplace:** Fábrica de Tabacos Francisco Donatién in Pinar del Río, about 100 hundred miles southwest of Havana

**What she reads:** Mornings,



HULTON-DEUTSCH COLLECTION/GETTY IMAGES

she reads novels and magazines (especially *Bohemia*, one of Cuba's most popular magazines). Afternoons, she reads news and articles suggested by the Federation of Cuban Women, a political group that represents women's interests in the workplace.

**Her audience:** Some 200 men and women who each produce about 120 hand-rolled cigars in an eight-hour shift

**How she got the job:** In 1998, while studying to become a librarian, she heard about the opening for a lector at this factory.

**Salary:** Equivalent to about \$22 U.S. a month

**Favorite authors:** 19th-century Cuban revolutionary José Martí and Chilean poet Pablo Neruda

**Most difficult part of her job:** Choosing reading material that will interest the workers

**Does she smoke?**

No, but some of the workers smoke cigars or cigarettes while they roll. (Castro himself gave up smoking 19 years ago.)

—Peter Gwin



# My Seven



## How to Survive a 2,000-mile Jungle Trek

**Mike Fay** *Conservationist, Wildlife Conservation Society*

What does it take to walk through the African rain forest for 456 days—and stay alive? One person knows: Mike Fay, NGS Conservation Fellow, who trekked from Congo to the Gabon coast, overcoming leeches, foot worms (bottom left), skin-shredding plants, and the near death of a team member (see the October 2000, March 2001, and August 2001 issues).

**1 Be prepared**  
For three months before the walk I spent long days researching and testing equipment and purchasing food. The night before I left I was in Kinko's at 4 a.m. plasticizing maps I had patched together from every conceivable source.

**2 Get lean** After a few months of walking, I was eating only about a thousand calories a day, but I felt like Tarzan. When you're light, your body takes less energy to maintain. By the time I reached the end of the trek, I weighed 121 pounds—39 pounds less than when I started.



NATIONAL GEOGRAPHIC PHOTOGRAPHER MICHAEL NICHOLS (ALL)

**3 Clothes? Overrated.** Humans in the tropical bush don't need to wear clothing. Clothes make you hot. Shirts and socks rot. Underwear hinders the gait. I wore only shorts and sometimes a raincoat.

**4 Don't bother with shoes or boots** Water and sand mix in shoes to turn feet into hamburger. I wore sport sandals every day—and when needed, some duct tape.

**5 Pack light** Don't bring anything you don't need. Six pounds of mildewed clothes or six pounds of rice? The choice could make a big difference.

**6 Talk to yourself** A grand march is a solitary thing. By all means, go with other people, but find solitude in your head. I tried to think like a sniper in wartime, losing myself in concentrated, meditative thought.

**7 Keep a sense of purpose** In order to achieve something substantial, you need skills, of course. But you also need the will to go as far as it takes, no matter what. There's only one thing that could've stopped me from completing my journey: death.

### WEBSITE EXCLUSIVE

Relive the Sights & Sounds of Mike Fay's great walk through the central African jungle ■ [nationalgeographic.com/magazine/0403](http://nationalgeographic.com/magazine/0403).



A man in a dark suit and headset stands on a balcony, looking out over a city. The city is overlaid with a white wireframe grid, representing a global network. The background shows a tall skyscraper on the left and a large, ornate building with multiple domes and spires in the center. The sky is a clear, light blue. The man is holding a briefcase in his right hand.

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# Do It Yourself

**ARMENIA** (SEE PAGE 28)



MESARHEM KAHANA/AFLO/GETTY IMAGES

**GO THERE**

## The Armenian Diaspora

With more Armenians living outside Armenia than in it, you can experience Armenian culture in enclaves around the world.

■ **Los Angeles** L.A. County boasts the largest Armenian community outside the homeland. The 200,000 Armenians here have their own television shows, newspapers, and schools. Check out the eateries in Hollywood's Little Armenia or Armenian poetry readings at Glendale's public library.

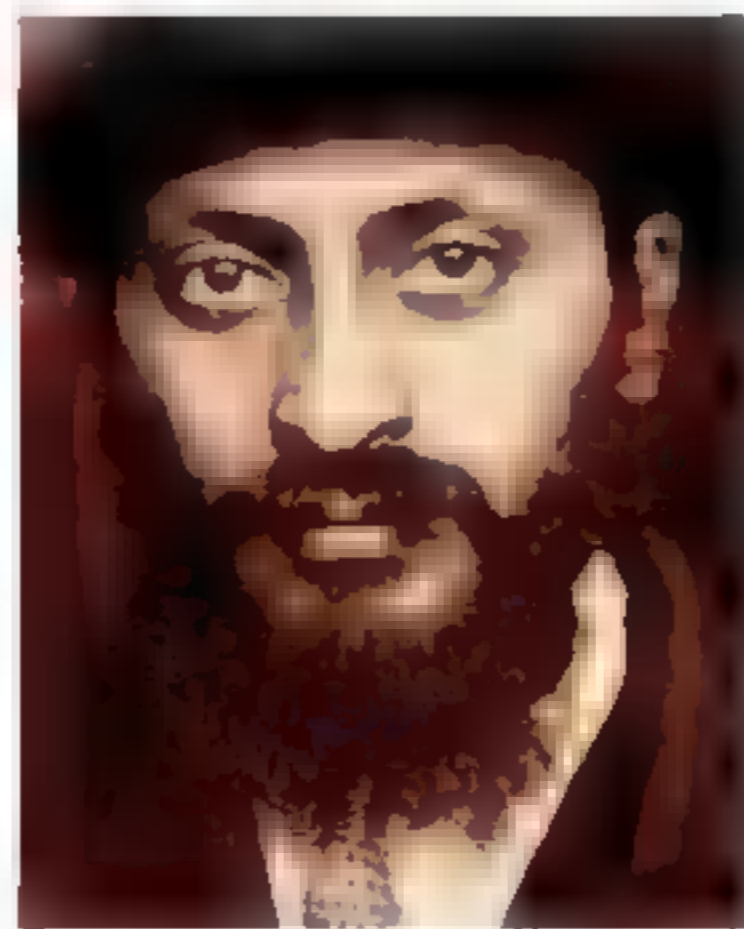
■ **Paris** The Musée Armenien de France features an extensive collection ranging from art to archaeology, but for a truly Parisian-Armenian experience, find a café that serves Armenian cognac and plays the torch songs of French-Armenian composer Charles Aznavour.

■ **Jerusalem** Armenians were among the earliest Christian pilgrims to the Holy Land, and the Armenian Quarter occupies a sixth of Jerusalem's walled Old City. Visit its centerpiece, the lavish Cathedral of St. James (above).

**TRY IT AT HOME**

## Trace a Wave of Immigration

From 1890 to 1924 nearly 100,000 Armenians came to the U.S., fleeing persecution under the Ottoman Turks and the devastation of World War I. Most arrived at Ellis Island and settled in the Northeast, but many soon left for the Midwest and California. For records of those who landed at Ellis Island, log on to [ellisland.org](http://ellisland.org) to view passenger manifests and photos of the ships that brought Armenians and others to America.



LEWIS WICKS HUNT/GEORGE FASTMAN HOUSE

**PICKS**

## 3 films

Photographer **Alexandra Avakian**, an Armenian-American, recommends three movies about the culture of her paternal grandparents.

■ **Ararat** (2002) "I think this poignant masterpiece—written, produced, and directed by Armenian-Canadian filmmaker Atom Egoyan—is essential for understanding the Armenian genocide in Turkey."

■ **The Color of Pomegranates** (1969) "An abstract and unconventional biography of 18th-century Armenian troubadour Sayat Nova. Director Sergei Paradjanov was jailed on and off during the Soviet period, a time when it was dangerous to celebrate Armenian culture."

■ **Enemy of the People** (1998) "Zareh Tjeknavorian's documentary about Stalin's purges includes survivor accounts and rare historic footage. This film is important to me because it describes how I lost a quarter of my family." (Available from the Armenian General Benevolent Union, New York.)

**WEBSITE EXCLUSIVE**

Read field notes by Alexandra Avakian and see more of her photographs from Armenia at [nationalgeographic.com/magazine/0403](http://nationalgeographic.com/magazine/0403).

**EMERGING EXPLORER ELIZABETH VINSON LONSDORF** Crouched among the trees, video camera whirring, Elizabeth Vinson Lonsdorf explores the mysteries of learning. The chimpanzee she records picks up a blade of grass, carefully trims it, and then extracts termites from their tunnels. Dinner is served! But how did the chimp develop this ingenious skill? Do the most skillful toolmaking mothers have the most skilled offspring? Here at Tanzania's Gombe Stream Research Center, Lonsdorf extends one of the world's longest running wild animal studies, unraveling how learning is transferred across generations.



## Probing the secrets of intelligence

"I'VE ALWAYS BEEN INTERESTED IN ANIMAL LEARNING AND TOOL USE—especially the way young animals grow up and learn their way in the world. When you look at chimpanzees, it's so easy to see the link between humans and the rest of the animal kingdom. They make and use tools, conduct warfare, and have very similar mother-child relationships as humans. By studying chimpanzees, we can gain insight into what the activities of our earliest ancestors might have been like. My long-term goal is conservation—making sure these wonderful and varied chimpanzee behaviors continue to exist!"

—Elizabeth Vinson Lonsdorf, Primatologist, Director of Conservation, Lincoln Park Zoo, Chicago

Around the world, the National Geographic Society has identified Emerging Explorers Program grantees who push the boundaries of discovery. Visit [www.nationalgeographic.com/emerging](http://www.nationalgeographic.com/emerging)

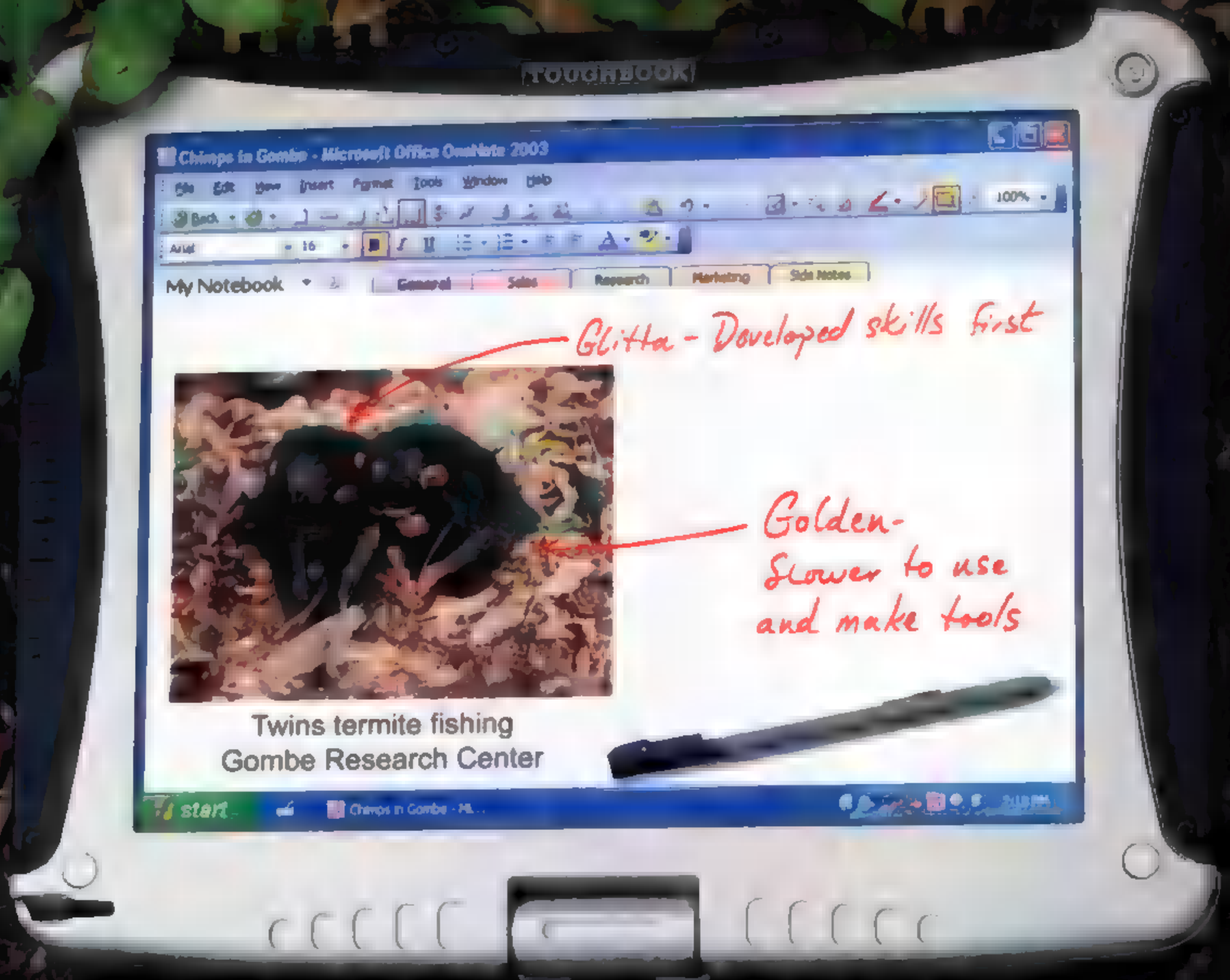


**Microsoft**

Your potential. Our passion.

Microsoft recognizes the crucial role technology plays in exploration. Their support of the National Geographic Emerging Explorers Program is helping these new explorers realize their potential.

Photo: Joshua Leonard, Science Museum of Minnesota (inset)



## Toolmaking, evolved.

Whether it's a chimp fishing for termites or a scientist documenting animal behavior, primatologist Elizabeth Vinson Lonsdorf recognizes the importance of using exactly the right tools. Today, recording data in the field and downloading pictures have become easier and more mobile than ever with the powerful Tablet PC—as simple to use as a pad and pen. The Tablet PC puts the full range of Windows®XP compatible applications, including Microsoft® Office System, at your command anytime, anyplace. To learn how the latest tool in personal computing can make you more effective, visit [microsoft.com/tabletpc](http://microsoft.com/tabletpc).



*\*OneNote software not included with the Tablet PC and must be purchased separately.*

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# Behind the SCENES

AT THE NATIONAL GEOGRAPHIC SOCIETY



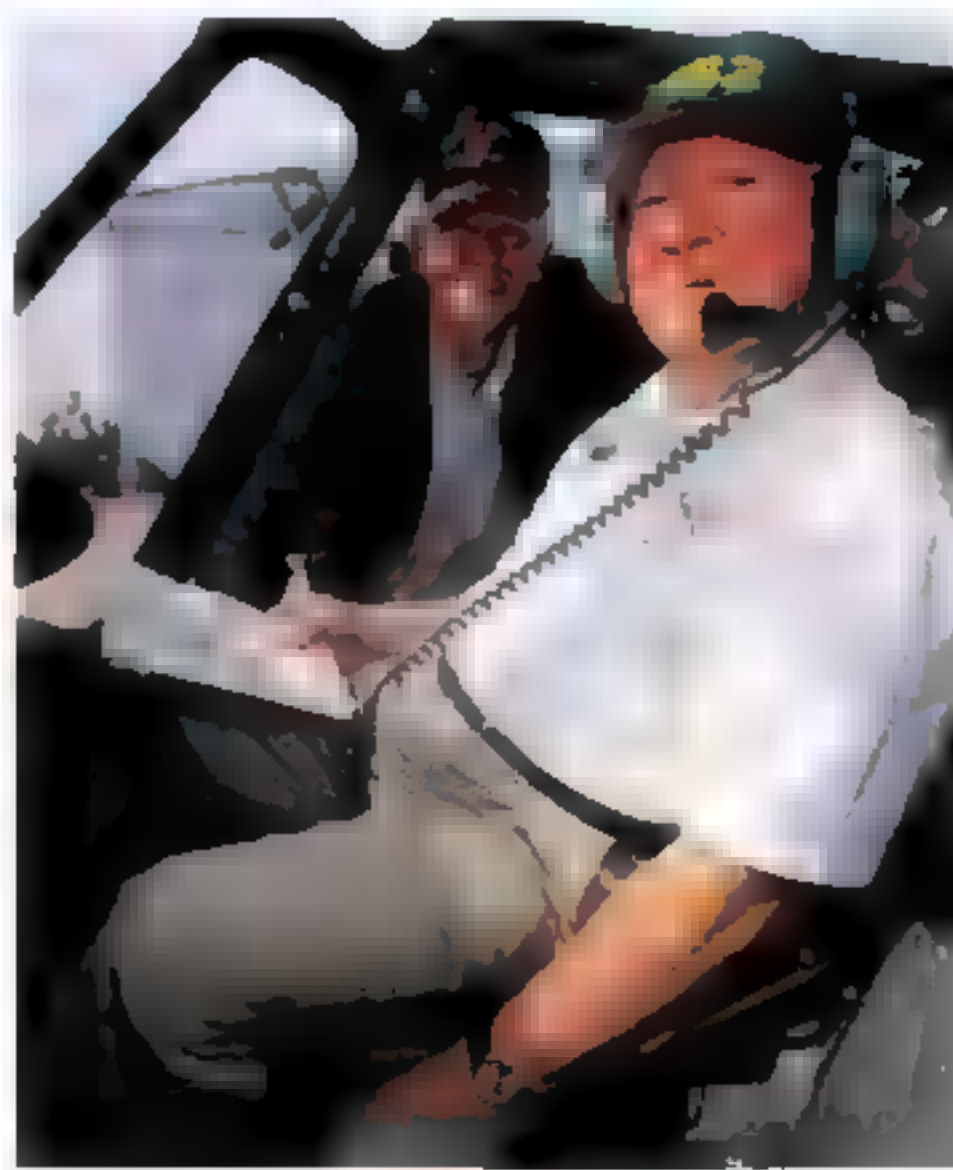
## An Angel Gets His Wings Back

*Vietnam pilot reunited with his craft*

Four decades ago, Archie Clapp (below, at right) commanded Marine squadrons for the first U.S. helicopter mission in Vietnam. His men, dubbed "Archie's Angels," flew aerial forays and dropped South Vietnamese troops into enemy territory. Photographs of Archie and his angels, taken by the legendary female war photographer, Dickey Chapelle, who died in Vietnam, appeared in the November 1962 *GEOGRAPHIC*. Archie came home in 1962 and left his whirlybirds behind. Or so he thought.

Twenty years later, enter Gerald Hail (right, at rear), a contractor with a passion for helicopters and a plan for starting an airlift business. He bought an old chopper, thinking he could use it for spare parts. When he took his purchase apart, he saw bullet holes and discovered it was from Archie's squadron. He bought two more Vietnam craft like the one Chapelle had photographed for *GEOGRAPHIC*. Using

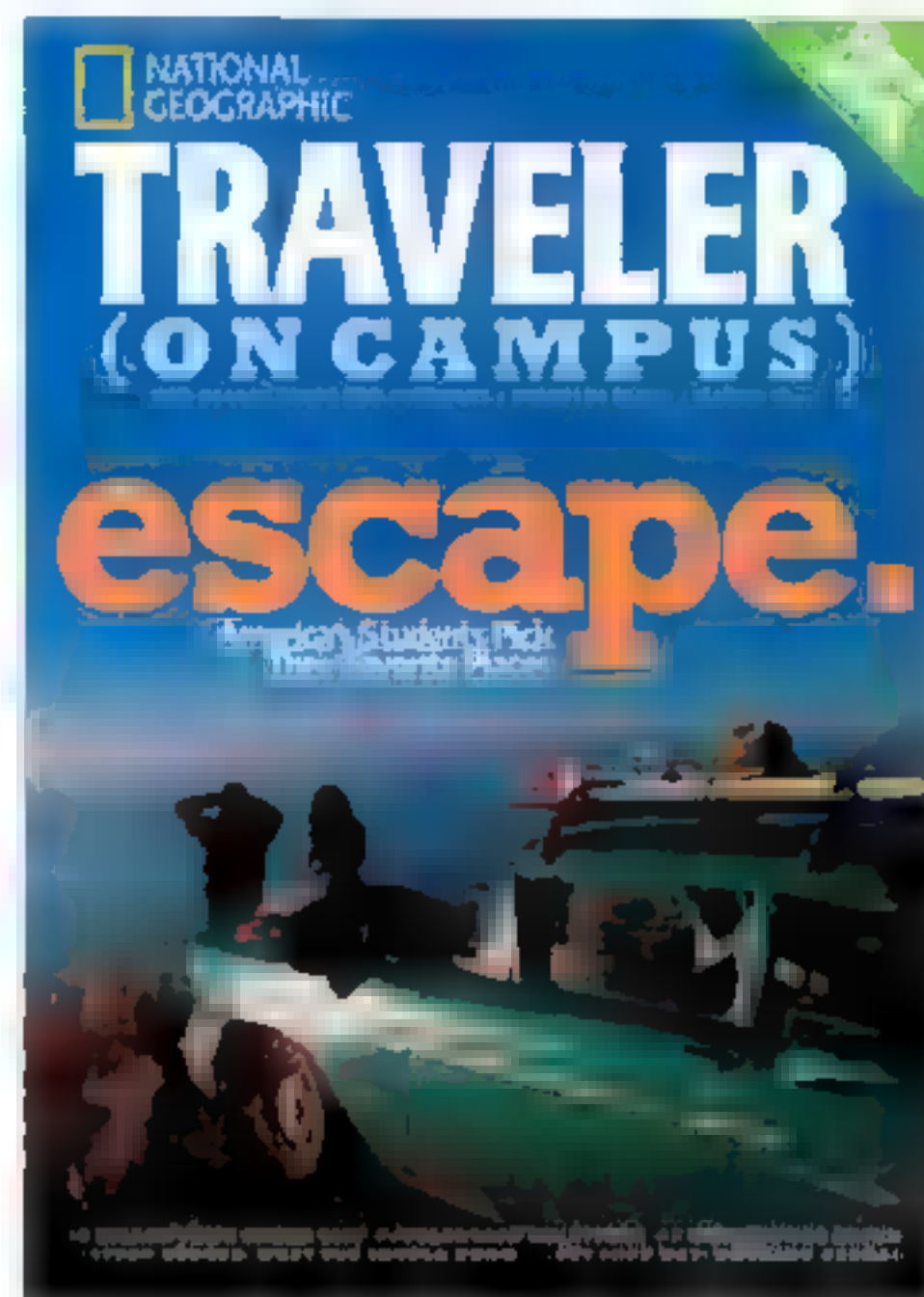
her picture (above) for guidance, he painted it to match the one Archie flew over Vietcong territory. Last October, on his Oklahoma ranch, Gerald reunited the angels with their helicopters. To thank him, Archie presented him with an award named for Dickey Chapelle. "Dickey liked to ride with me because I was the first to land," says Archie. "She'd jump out while we were taking enemy fire. Wasn't a day went by that I didn't end up scolding her for her bravery."



PENNY DEJUS SANTOS

## Traveler Goes to College

*Advice for students with big plans, small budgets*



The staff of *National Geographic Traveler* learned something interesting in their discussions with interns: College students are traveling farther and more intelligently than ever before. With that in mind, the editors created *Traveler On Campus*, a shorter version of the magazine for intrepid collegiate souls with limited funds and lots of wanderlust. The first issue will include ten vacations under \$500, study abroad possibilities, volunteer vacations, tips on travel safety, and great deals on cheap hotels—should travelers decide to splurge on hot showers and clean sheets.

Written by students, *Traveler On Campus* will be inserted in college newspapers across the United States.



MICHAEL FURNBERG

## Live From Nebraska

*Massive winged migration comes to the Web*

As late winter slides into spring, flocks of migrating sandhill cranes show up along the Platte River Valley in south-central Nebraska. Each year about half a million make a stop in Nebraska on their way from the American Southwest to the Arctic region. When Editor Bill Allen went to the Platte to see the “clouds of blue-gray birds” for himself, he came away feeling their annual passage was “one of the great sights of nature” (March 2001 issue). He also remembers how cold it was, hunkered down watching the birds.

Now you can watch the great avian migration from the comfort of your home. In a joint project, the National Geographic Society and Audubon’s Rowe Sanctuary have installed a remote camera along the Platte, and it’s

linked with the GEOGRAPHIC website to broadcast live footage of these elegant creatures as they go about their daily routines.

Near dawn each day the cranes begin to stir, stretching their pencil-thin legs, fluffing feathers, and gulping down river water. Then they fly off in pairs, dozens, or hundreds to forage for food in the area’s wet meadows and farm fields. The cranes are partial to corn (it helps them add the 18 percent body fat they need to reach their subarctic breeding grounds), and they feast on leftovers from crop harvests. Once they’ve eaten, the cranes may take time for a little “dancing”—a mating ritual that gets couples in the mood for the upcoming breeding season.

As dusk falls, the birds return to roost on the river’s submerged

sandbars, where they’re safe from land predators, but not from those above. When bald eagles fly overhead, 20,000 cranes can suddenly fill the sky. “Watching all of them take off at once is like seeing spectators doing the wave at a sports event,” says the Rowe Sanctuary’s naturalist Kent Skaggs.

Ducks, geese, terns, and plovers also find the Platte River Valley a good place for a stop-over, but sanctuary director Paul Tebbel says the cranes are “large, loud, and fun to watch. It’s an incredible emotional lift when I first hear them. It tells me that spring is coming.”

Watch the sandhill cranes live at [nationalgeographic.com/magazine/0403](http://nationalgeographic.com/magazine/0403). Prime viewing time is an hour after sunrise and an hour before sunset (exact times listed on website). For periods when the cranes are out of viewing range, the website also features a photo gallery and video-clip highlights.





## WHAT ARE YOU DOING TO HELP PROTECT YOUR HEART?

You do all kinds of things to help safeguard yourself. And yet, if you've had a heart attack or stroke, it's important to ask your doctor if you're doing enough to help protect your heart. The Heart Protection Study by Oxford University, funded in part by Merck, researched ZOCOR.

ZOCOR is the first and only cholesterol medication proven to significantly reduce the risk of heart attack and stroke in people with heart disease. Regardless of cholesterol level.

Before the Heart Protection Study was complete, ZOCOR was a time-tested, cholesterol-lowering medication, with over 160 million prescriptions filled in the past 11 years.

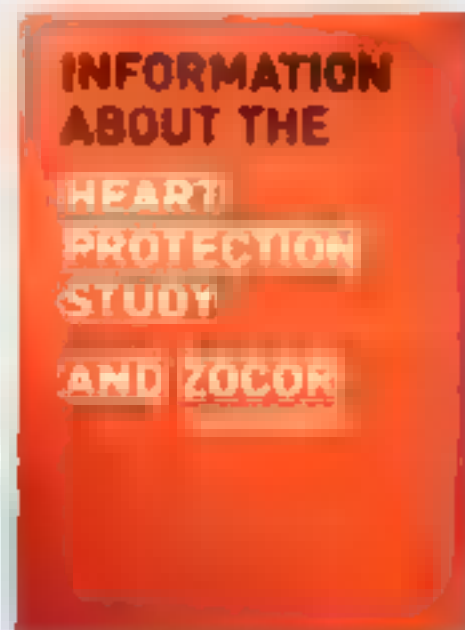
Ask your doctor how ZOCOR, along with a healthy diet, can help protect you. Get information about the Heart Protection Study and ZOCOR at [zocor.com](http://zocor.com) or call 1-800-MERCK-75.



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To find out if you qualify, call 1-800-MERCK-75



**ZOCOR**  
SIMVASTATIN

**Important considerations:** ZOCOR is a prescription medicine and isn't right for everyone, including women who are nursing or pregnant or who may become pregnant, anyone with liver problems, and people who are allergic to any ingredients of ZOCOR. Unexplained muscle pain or weakness could be a sign of a rare but serious side effect and should be reported to your doctor right away. Your doctor may do blood tests before and during treatment with ZOCOR to check for liver problems. To avoid serious side effects, discuss with your doctor medicine or food you should avoid while on ZOCOR.

**YOUR RESULTS MAY VARY.**

PLEASE READ THE MORE DETAILED INFORMATION ABOUT ZOCOR IMMEDIATELY FOLLOWING THIS AD.

ASK YOUR DOCTOR IF ZOCOR IS RIGHT FOR YOU.

**ZOCOR. It's your future. Be there.**

# ZOCOR<sup>®</sup>

(SIMVASTATIN)

PLEASE READ THIS SUMMARY CAREFULLY, THEN ASK YOUR DOCTOR ABOUT ZOCOR. NO ADVERTISEMENT CAN PROVIDE ALL THE INFORMATION NEEDED TO PRESCRIBE A DRUG. THIS ADVERTISEMENT DOES NOT TAKE THE PLACE OF CAREFUL DISCUSSIONS WITH YOUR DOCTOR. ONLY YOUR DOCTOR HAS THE TRAINING TO WEIGH THE RISKS AND BENEFITS OF A PRESCRIPTION DRUG FOR YOU.

## USES OF ZOCOR

ZOCOR is a prescription drug that is indicated as an addition to diet for many patients with high cholesterol. For patients at high risk of coronary heart disease (CHD) because of existing heart disease, diabetes, vascular disease, or history of stroke, ZOCOR is indicated along with diet to reduce the risk of death by reducing coronary death, reduce the risk of heart attack and stroke; and reduce the need for revascularization procedures.

## WHEN ZOCOR SHOULD NOT BE USED

Some people should not take ZOCOR. Discuss this with your doctor.

ZOCOR should not be used by patients who are allergic to any of its ingredients. In addition to the active ingredient simvastatin, each tablet contains the following inactive ingredients: cellulose, lactose, magnesium stearate, iron oxides, talc, titanium dioxide, and starch. Butylated hydroxyanisole is added as a preservative.

**Patients with liver problems:** ZOCOR should not be used by patients with active liver disease or repeated blood test results indicating possible liver problems. (See WARNINGS.)

**Women who are or may become pregnant:** Pregnant women should not take ZOCOR because it may harm the fetus. **Women of childbearing age should not take ZOCOR unless it is highly unlikely that they will become pregnant.** If a woman does become pregnant while on ZOCOR, she should stop taking the drug and talk to her doctor at once.

**Women who are breast-feeding** should not take ZOCOR.

## WARNINGS

**Muscle:** Tell your doctor right away if you experience any unexplained muscle pain, tenderness, or weakness at any time during treatment with ZOCOR so your doctor can decide if ZOCOR should be stopped. Some patients may have muscle pain or weakness while taking ZOCOR. Rarely, this can include muscle breakdown resulting in kidney damage. The risk of muscle breakdown is greater in patients taking certain other drugs along with ZOCOR:

- Cyclosporine, itraconazole, ketoconazole, erythromycin, clarithromycin, HIV protease inhibitors, the antidepressant nefazodone, or large quantities of grapefruit juice (>1 quart daily), particularly with higher doses of ZOCOR.
- Gemfibrozil particularly with higher doses of ZOCOR.
- Other lipid lowering drugs (other fibrates or  $\geq 1$  g/day of niacin) that can cause myopathy when given alone.
- Amiodarone or verapamil with higher doses of ZOCOR.

The risk of muscle breakdown is greater at higher doses of simvastatin.

Because the risk of muscle side effects is greater when ZOCOR is used with the products listed above, the combined use of these products should be avoided unless your doctor determines the benefits are likely to outweigh the increased risks.

The dose of ZOCOR should not exceed 10 mg daily in patients receiving gemfibrozil. The combined use of ZOCOR and gemfibrozil should be avoided, unless your doctor determines that the benefits outweigh the increased risks of muscle problems. Caution should be used when using ZOCOR with other fibrates or niacin because these can cause muscle problems when taken alone.

No more than 10 mg/day of ZOCOR should be taken with cyclosporine.

The combined use of verapamil or amiodarone with doses above ZOCOR 20 mg should be avoided unless your doctor determines the benefits outweigh the increased risk of muscle breakdown.

Your doctor should also carefully monitor for any muscle pain, tenderness, or weakness, particularly during the initial months of therapy and if the dose of either drug is increased. Your doctor also may monitor the level of certain muscle enzymes in your body, but there is no assurance that such monitoring will prevent the occurrence of severe muscle disease.

The risk of muscle breakdown is greater in patients with kidney problems or diabetes.

If you have conditions that can increase your risk of muscle breakdown, which in turn can cause kidney damage, your doctor should temporarily withhold or stop ZOCOR<sup>®</sup> (simvastatin). Also, since there are no known adverse consequences of briefly stopping therapy with ZOCOR, treatment should be stopped a few days before elective major surgery and when any major acute medical or surgical condition occurs. Discuss this with your doctor, who can explain these conditions to you.

**Liver:** About 1% of patients who took ZOCOR in clinical trials developed elevated levels of some liver enzymes. Patients who had these increases usually had no symptoms. Elevated liver enzymes usually returned to normal levels when therapy with ZOCOR was stopped.

In the ZOCOR Survival Study the number of patients with more than 1 liver enzyme level elevation to greater than 3 times the normal upper limit was no different between the ZOCOR and placebo groups. Only 8 patients on ZOCOR and 5 on placebo discontinued therapy due to elevated liver enzyme levels. Patients were started on 20 mg of ZOCOR, and one third had their dose raised to 40 mg.

Your doctor should perform routine blood tests to check these enzymes before you start treatment with ZOCOR and thereafter when clinically indicated. Patients titrated to the 80-mg dose should receive an additional test at 3 months and periodically thereafter (eg, semiannually) for the first year of treatment. If your enzyme levels increase, your doctor should order more frequent tests. If your liver enzyme levels remain unusually high, your doctor should discontinue your medication.

Tell your doctor about any liver disease you may have had in the past and about how much alcohol you consume. ZOCOR should be used with caution in patients who consume large amounts of alcohol.

## PRECAUTIONS

**Drug Interactions:** Because of possible serious drug interactions, it is important to tell your doctor what other drugs you are taking, including those obtained without a prescription. You should also tell other doctors who are prescribing a new medicine for you that you are taking ZOCOR. ZOCOR can interact with the following:

- Itraconazole
- Ketoconazole
- Erythromycin
- Clarithromycin
- HIV protease inhibitors
- Nefazodone
- Cyclosporine
- Large quantities of grapefruit juice (>1 quart daily)

The risk of myopathy is also increased by gemfibrozil and to a lesser extent other fibrates and niacin (nicotinic acid) ( $\geq 1$  g/day).

The risk of muscle breakdown is increased with other drugs:

- Amiodarone
- Verapamil

Some patients taking lipid-lowering agents similar to ZOCOR and coumarin anti-coagulants (a type of blood thinner) have experienced bleeding and/or increased blood clotting time. Patients taking these medicines should have their blood tested before starting therapy with ZOCOR and should continue to be monitored.

**Central Nervous System Toxicity; Cancer, Mutations, Impairment of Fertility:** Like most prescription drugs, ZOCOR was required to be tested on animals before it was marketed for human use. Often these tests were designed to achieve higher drug concentrations than humans achieve at recommended dosing. In some tests, the animals had damage to the nerves in the central nervous system. In studies of mice with high doses of ZOCOR, the likelihood of certain types of cancerous tumors increased. No evidence of mutations or damage to genetic material has been seen. In 1 study with ZOCOR, there was decreased fertility in male rats.

**Pregnancy:** Pregnant women should not take ZOCOR because it may harm the fetus.

Safety in pregnancy has not been established. In studies with lipid-lowering agents similar to ZOCOR, there have been rare reports of birth defects of the skeleton and digestive system. Therefore, women of childbearing age should not take

ZOCOR® (simvastatin) unless it is highly unlikely they will become pregnant. If a woman does become pregnant while taking ZOCOR, she should stop taking the drug and talk to her doctor once. The active ingredient of ZOCOR did not cause birth defects in rats 3 times the human dose or in rabbits at 3 times the human dose.

**Nursing Mothers:** Drugs taken by nursing mothers may be present in their breast milk. Because of the potential for serious adverse reactions in nursing infants, a woman taking ZOCOR should not breast-feed. (See WHEN ZOCOR SHOULD NOT BE USED.)

**Pediatric Use:** ZOCOR is not recommended for children or patients under 10 years of age.

**Geriatric Use:** Higher blood levels of active drug were seen in elderly patients (70–78 years of age) compared with younger patients (18–30 years of age) in 1 study. In other studies, the cholesterol-lowering effects of ZOCOR were at least as great in elderly patients as in younger patients and there were no overall differences in safety between elderly and younger patients over the 20–80 mg/day dosage range. Of the 7 cases of myopathy/rhabdomyolysis among 10,269 patients on ZOCOR in another study, 4 were aged 65 or more (at baseline), 1 of whom was over 75.

#### SIDE EFFECTS

Most patients tolerate treatment with ZOCOR well; however, like all prescription drugs, ZOCOR can cause side effects, and some of them can be serious. Side effects that do occur are usually mild and short-lived. Only your doctor can weigh the risks versus the benefits of any prescription drug. In clinical studies with ZOCOR, less than 1.5% of patients dropped out of the studies because of side effects. In 2 large, 5-year studies, patients taking ZOCOR experienced similar side effects to those patients taking placebo (sugar pills). Some of the side effects that have been reported with ZOCOR or related drugs are listed below. This list is not complete. Be sure to ask your doctor about side effects before taking ZOCOR and discuss any side effects that occur.

**Digestive System:** Constipation, diarrhea, upset stomach, gas, heartburn, stomach pain/cramps, anorexia, loss of appetite, nausea, inflammation of the pancreas, hepatitis, jaundice, fatty changes in the liver, and, rarely, severe liver damage and failure, cirrhosis, and liver cancer.

**Muscle, Skeletal:** Muscle cramps, aches, pain, and weakness; joint pain; muscle breakdown.

**Nervous System:** Dizziness, headache, insomnia, tingling, memory loss, damage to nerves causing weakness and/or loss of sensation and/or abnormal sensations, anxiety, depression, tremor, loss of balance, psychic disturbances.

**Skin:** Rash, itching, hair loss, dryness, nodules, discoloration.

**Eye/Senses:** Blurred vision, altered taste sensation, progression of cataracts, eye muscle weakness.

**Hypersensitivity (Allergic) Reactions:** On rare occasions, a wide variety of symptoms have been reported to occur either alone or together in groups (referred to as a syndrome) that appeared to be based on allergic-type reactions, which may rarely be fatal. These have included 1 or more of the following: a severe generalized reaction that may include shortness of breath, wheezing, digestive symptoms, and low blood pressure and even shock; an allergic reaction with swelling of the face, lips, tongue, and/or throat with difficulty swallowing or breathing; symptoms mimicking lupus (a disorder in which a person's immune system may attack parts of his or her own body), severe muscle and blood vessel inflammation, sometimes including rash; bruises; various disorders of blood cells (that could result in anemia, infection, or blood clotting problems) or abnormal blood tests; inflamed or painful joints; hives, fatigue and weakness; sensitivity to sunlight; fever, chills, flushing; difficulty breathing; and severe skin disorders that vary from rash to a serious burn-like shedding of skin all over the body, including mucous membranes such as the lining of the mouth.

**Other:** Loss of sexual desire, breast enlargement, impotence.

**Laboratory Tests:** Liver function test abnormalities including elevated alkaline phosphatase and bilirubin, thyroid function abnormalities.

**NOTE:** This summary provides important information about ZOCOR. If you would like more information, ask your doctor or pharmacist to let you read the prescribing information and then discuss it with them.



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*eat,  
drink,  
and  
be  
charitable.*

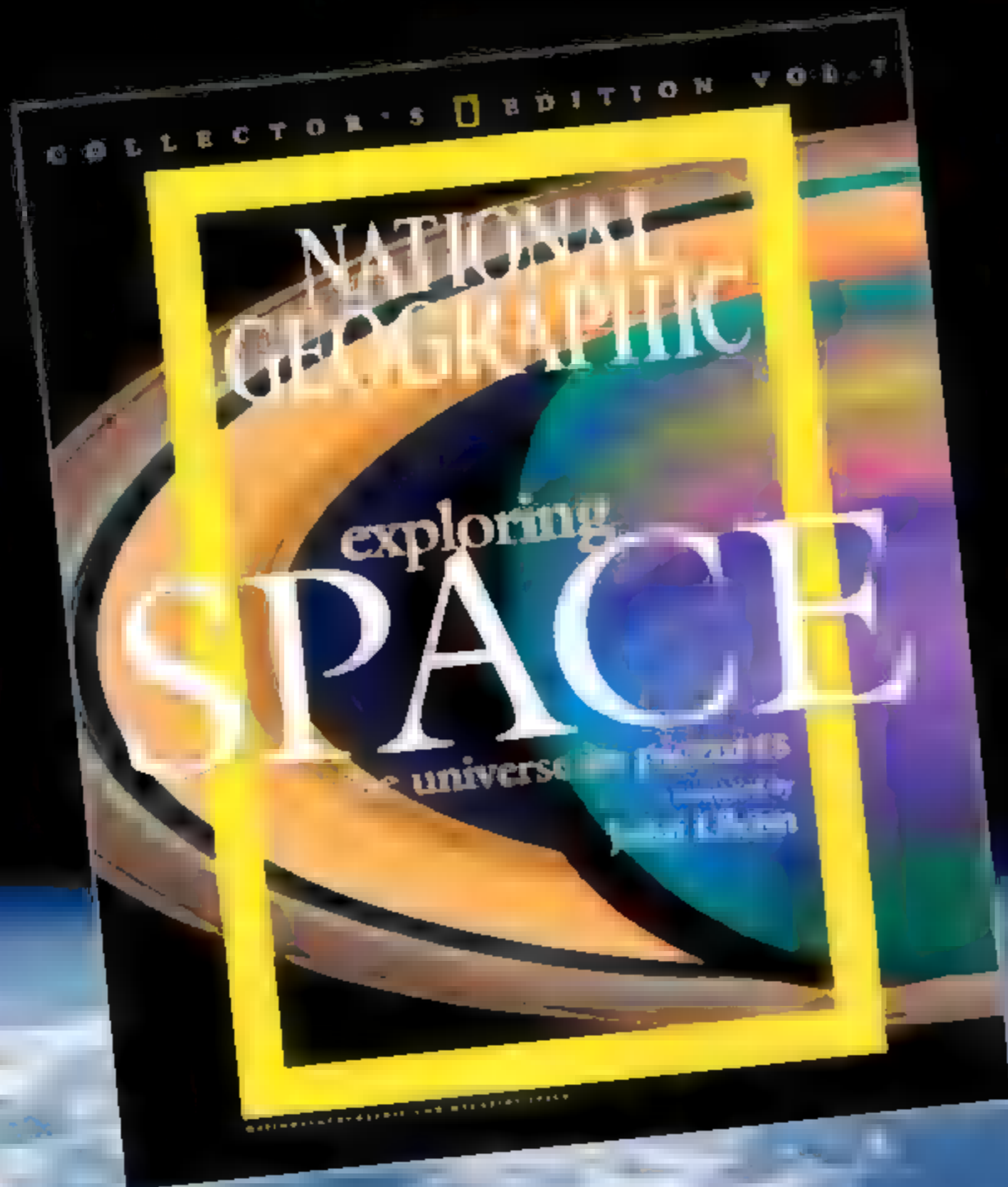


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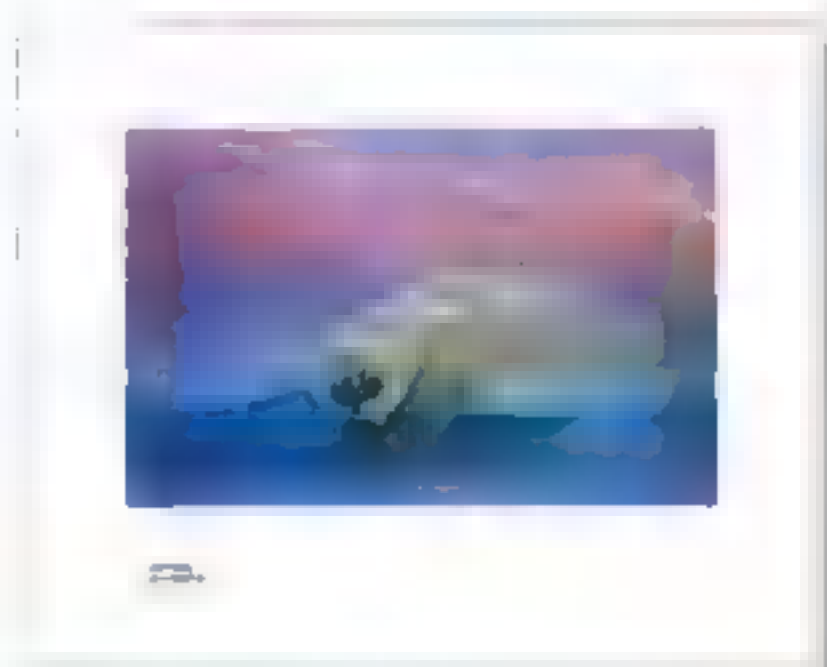


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SPECIAL EDITION POSTER

Poster Pup



Tears cling to the eyes of newborn harp seals. "They lack the ducts that remove excess fluid, so they're always crying," says biologist Mike Hammill. "It sort of tugs on your heartstrings." Since antisealing activists used the pups as a symbol during their campaign against seal hunting, Canadian law has banned the commercial hunting of the whitecoat harp seal pups—and their numbers have risen. Hunted or not, the harp seal makes a good poster pup, so we've featured Brian Skerry's photograph (pages 66-7) as our latest selection.

The poster is available for \$29.95 plus \$6.95 for shipping (\$9.95 for international orders). Please add appropriate sales tax for orders sent to CA, DC, FL, KY, MI, PA, VA, VT, and Canada. We will produce only as many 24-by-20-inch posters as we receive orders for by midnight on April 30, 2004. Each will be hand-numbered and embossed with the Society seal. Shipping is scheduled for June 2004. Call toll free: 1-888-647-6733 (outside the U.S. and Canada call 1-515-362-3353) or order online at [nationalgeographic.com/magazine](http://nationalgeographic.com/magazine).



▲ PHOTOGRAPH BY ALEXANDRA AVAKIAN; (PREVIOUS PAGE) PAUL GENI (BOOK JACKET)

Through a Child's Eyes

GEOGRAPHIC picture inspires book

When Cathryn Clinton was given a graduate school assignment to write a short piece about a picture—any picture—she turned to NATIONAL GEOGRAPHIC.

"I read the 1996 article about life in the Gaza Strip, and I saw this picture [above] of a girl with a bird in her hand," says Cathryn. "All around her was poverty, yet her eyes had this determined look." Cathryn's assignment ultimately became a book, *A Stone in My Hand*, published by Candlewick Press. It tells the story of an 11-year-old Palestinian girl from Gaza who copes with living on the front lines of the Israeli-Palestinian conflict by imagining life through the eyes of her dove.

"The ability of children to dissociate themselves from suffering in order to survive is what interests me," Cathryn says. "The picture of this girl says so much about that ability."

Alexandra Avakian, who photographed the girl for the September 1996 GEOGRAPHIC, is thrilled with the book. "I hoped the fragility of the peace process would be communicated somehow by the shot of Fatimah—in her eyes, her environment, the way she holds the dove," says Alexandra. "I want my son to have Cathryn's book."



GET MORE

To learn more about a subject covered in this issue, try these National Geographic Society products and services. Call 1-888-225-5647 or log on to [nationalgeographic.com](http://nationalgeographic.com) for more information.



CANADA'S STIKINE RIVER VALLEY (PAGE 102)

- **Wade Davis Online** Learn more about the story's author, anthropologist Wade Davis, and his work as a National Geographic explorer-in-residence at [nationalgeographic.com/council/eir](http://nationalgeographic.com/council/eir). Follow links to other websites with more information on vanishing cultures.
- **National Geographic Guide to America's Outdoors: Western Canada** Plan your own trip to Western Canada's great natural sites. The guidebook includes information on the landscapes, plants, and animals of British Columbia, and the best places to hike, canoe, and ski (\$24).
- **Canada Political Map** Trace the route of the Stikine River through the trackless expanses of northern Canada. To order, go to [nationalgeographic.com/maps](http://nationalgeographic.com/maps) or call 1-800-962-1643.

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**Three-banded Armadillo** (*Tolypeutes tricinctus*)

**Size:** Head and body length, 30-40 cm; tail, 6-8 cm **Weight:** 1.2-2.2 kg

**Habitat:** Tropical deciduous forests and open dry savannas of northeastern and east-central Brazil

**Surviving number:** Unknown; populations declining



Photographed by Luiz Claudio Marigo

# WILDLIFE AS CANON SEES IT

Snap! The three-banded armadillo seems to be leaving gaps in its armor when it rolls into a protective ball. But poke it on the chest or abdomen and, as would-be predators have discovered the hard way, its shells snap shut like a steel trap. The only armadillo able to roll into a perfect ball, this insect eater is well protected from most predators. A perfect ball provides imperfect protection from poachers, however; they simply

carry it off. Hunting and habitat loss have ravaged populations, and it is already considered extinct over some portions of its range. In the end, humans are the real chink in this armadillo's armor.

As an active, committed global corporation, we join worldwide efforts to promote awareness of endangered species. Just one way we are working to make the world a better place—today and tomorrow.

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# Canon



# Who Knew?

## THE UNIVERSE

### Dust in Space

*It's downright dirty out there in the cosmos*

Space isn't empty. It's full of schmutz. As the Earth makes its annual journey around the sun, it collects about 40,000 tons of dust. Not to put too fine a point on it, but space



is filthy. Jets designed to spy on the former Soviet Union now stream through the stratosphere with the peaceful purpose of collecting tiny grains of cosmic dust. Scientists put the dust under the microscope and try to discern its message. They've collected so much that NASA has an online cosmic dust catalog (more evidence that you can find anything on the Internet).

Although hydrogen and helium are the most common elements found in space, the dust is made of heavier atoms born in the hearts of stars and supernovae: oxygen, nitrogen, iron, even a smattering of gold and uranium—pretty much the entire periodic table.

Dust isn't the only stuff sullyng space. As many of us learned last fall, solar storms occasionally trigger a "coronal mass ejection," a spew of charged particles that can disrupt communications systems and intensify the northern lights. Even on a calm day, the sun emits a mighty solar wind, a stream of protons and heavy elements racing through space.

Despite all the stuff, not all parts of space are equally dirty. As you get outside the solar system, into interstellar space, particles become few and far between. In fact, our solar system is traveling through an area of relatively empty space right now. The current theory is that a supernova cleared out the region millions of years ago. The signature of that explosion (or maybe there was more than one) would be extremely hot, fast-moving particles, the equivalent of embers from an ancient fire.

A new space probe called the Cosmic Hot Interstellar Plasma Spectrometer, or CHIPS, is looking for signs of those embers in what scientists call the local hot bubble, but so far has only found traces of them. The local hot bubble doesn't seem to be that hot, and the emptiness can't yet be explained. But CHIPS will keep looking.

The way things are arranged gives us clues to our galactic past. "It's like archaeology," says Mark Hurwitz, principal CHIPS investigator. "The galaxy is not in perfect equilibrium. It's constantly percolating, stirred up by supernovae."

Even if our local bubble turns out to be as hot as we think it should be, and as clean (by the scuzzy standards of outer space), it wouldn't be the empty void—the vacuum—that we were brought up to believe in. If you could extract everything from space, all the dust, the zooming intergalactic particles, all the photons from impossibly distant stars, you still wouldn't be left with pure nothingness. Quantum physics tells us that the "vacuum" is shot through with virtual particles winking in and out of existence all the time.

In this universe, void is prohibited.

—Joel Achenbach

WASHINGTON POST STAFF WRITER

## IT MATTERS

**If you're outside Earth's protective atmosphere, dust can be a scary thing.** Technically meteoroids, bits of space dust—most are smaller than the diameter of a hair—can whiz along at 150,000 miles an hour. A particle the size of a pinhead can crash into a satellite or a space-walking astronaut like a .22-caliber bullet fired at point-blank range. That's why space suits and satellites are designed to withstand thousands of tiny meteoroid impacts on every bit of exposed surface. Engineers will even go to the trouble of reorienting a satellite to present the smallest possible target if it's about to encounter a dust storm. Managing the dangers of space dust matters. If a satellite isn't protected, dust can pit solar panels, scratch telescope mirrors, and short out sensitive electronics.

—Lynne Warren

## WEBSITE EXCLUSIVE

For more about space dust, and for links to Joel Achenbach's work, go to Resources at [nationalgeographic.com/magazine/0403](http://nationalgeographic.com/magazine/0403).



H O T S P O T S

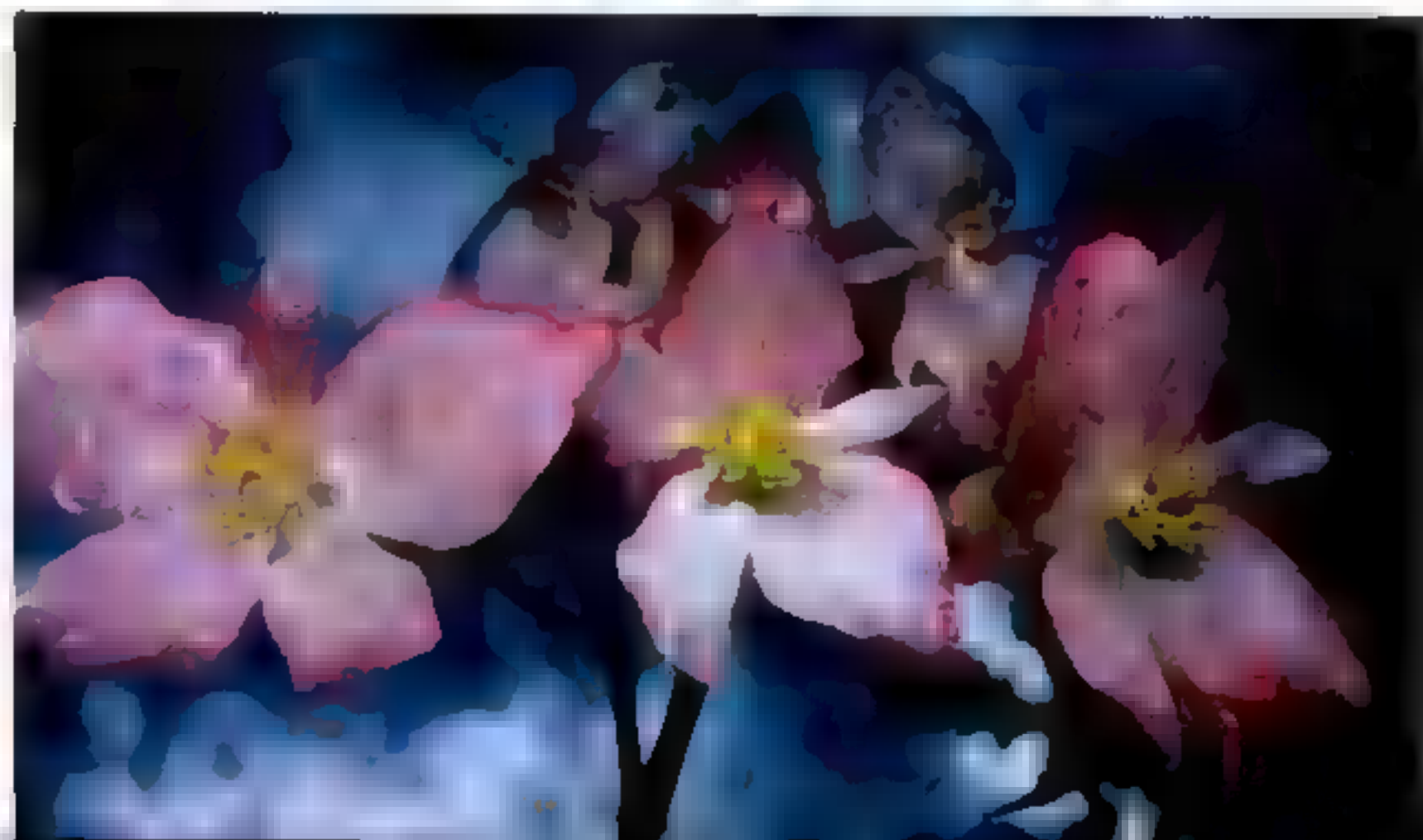
# The Rain Forest in Rio's Backyard

**Brazil's Atlantic forest rivals the Amazon with its eye-popping array of unique plants and animals, yet its proximity to Rio de Janeiro and other cities puts it at even greater risk. Now scientists are testing an approach to answer the question: Can a rain forest be brought back to life?**

BY VIRGINIA MORELL

PHOTOGRAPHS BY MARK W. MOFFETT

LEFT: BRACHYCEPHALUS DIDACTYLUS (FLEA FROG); BELOW: BEGONIA SANTOSLIMAE BRADE





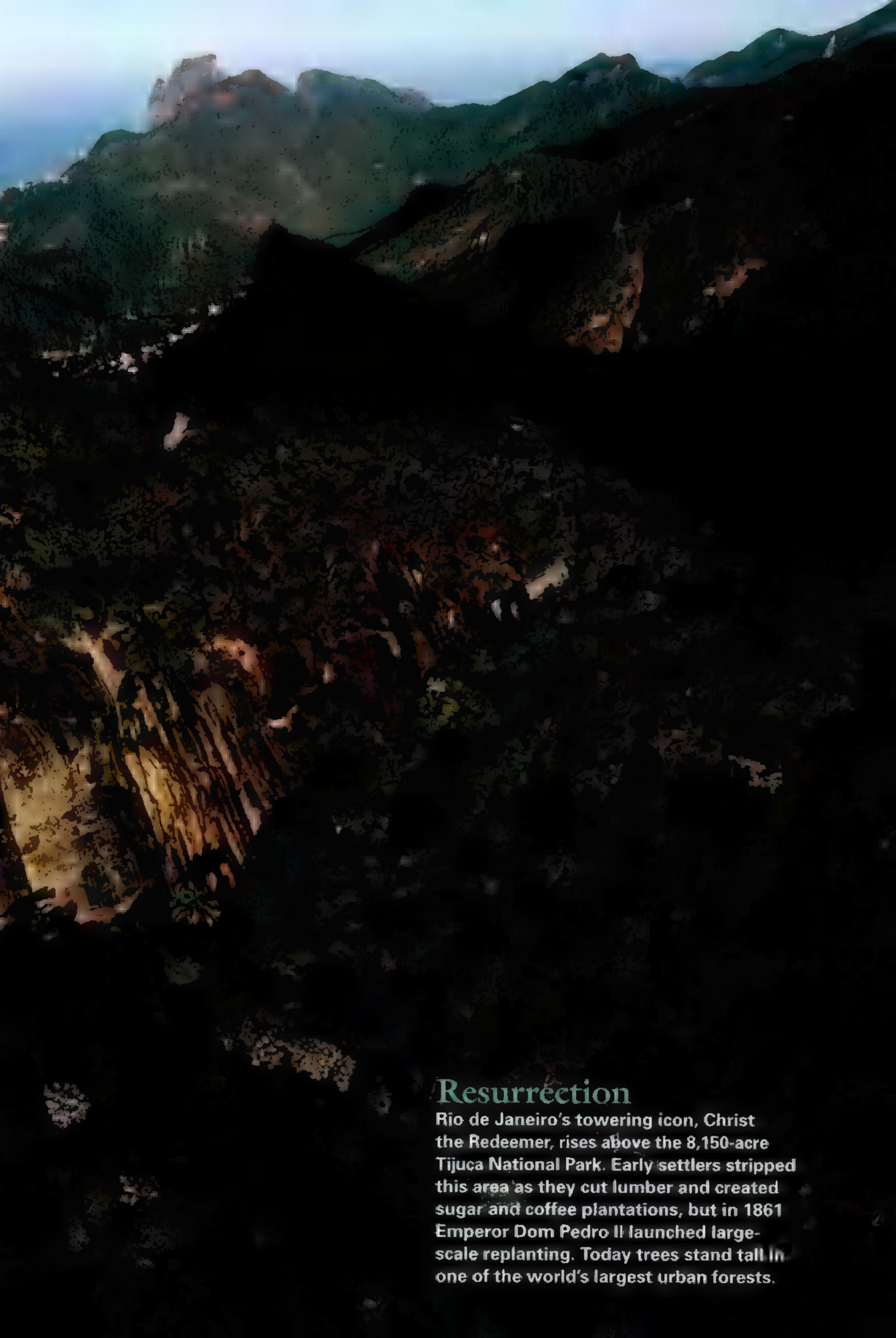


## Squeezed Tight

Native to the now fragmented forests in the state of Bahia, a golden-headed lion tamarin with a radio collar stretches out in the forest canopy. Scientists who track this endangered species believe its survival may hang on creating forested corridors to link the scattered patches of its habitat.

*LEONTOPITHECUS CHRYSOMELAS* (GOLDEN-HEADED LION TAMARIN)





## Resurrection

Rio de Janeiro's towering icon, Christ the Redeemer, rises above the 8,150-acre Tijuca National Park. Early settlers stripped this area as they cut lumber and created sugar and coffee plantations, but in 1861 Emperor Dom Pedro II launched large-scale replanting. Today trees stand tall in one of the world's largest urban forests.



“It’s always like this,” says Adriano Chiarello. “You know they’re here, but you can’t see them.” The Brazilian conservation biologist bends his neck backward like a yoga master to peer at a tree’s uppermost branches a hundred feet above us. Somewhere in the leafy canopy, a female maned sloth and her eight-month-old infant are hidden from view. A steadily beeping radio signal from the mother’s collar has brought Chiarello to the base of the tree, but even technology has its limits. The biologist must now spot the pair the old-fashioned way: with his eyes alone.

“If they don’t move, we may never see them,” Chiarello sighs. “And you know, they really are sloths. They spend hours sitting, sleeping, never moving. That’s what they do 80 to 90 percent of the day: nothing.”

He wipes his eyes, shakes his head, then returns to his craning yoga pose. “Wait. . . . Maybe my insult has worked. Look there—right over your head. She’s braced against a branch.”

I follow Chiarello’s pointed finger and spy the mother’s dark brown face among the leaves. She buries her face under her arm and looks instantly like a large, furred coconut or bees’ nest.

“Do you see that? How she can vanish?” Chiarello asks. “For their size, they are so well camouflaged. And . . . wow! Now she’s moving!”

For Chiarello, such a sloth-on-the-move sighting is a peak experience, the ultimate biological

moment that holds the promise of new insights.

The baby sloth, looking like a Teletubby wearing a curly lambskin coat, emerges from its mother’s arms. It climbs over her and then playfully—lazily—slaps at its mother’s face. The mother does nothing in return. “They never respond to their babies,” whispers Chiarello, adding that mother sloths neither play nor get angry with their offspring. Instead, with all the speed of a desert tortoise, the mother reaches an arm out to a nearby branch and nibbles the leaves.

Chiarello’s graduate students—at the Catholic University of Minas Gerais, where he’s a professor—busily take notes. We all stretch our

necks, craning this way and that, to keep the sloths in view as the pair move like sleepwalking high-wire artists along the branches to the freshest leaves. Astonishingly, given the mother’s 15-pound build, she and her baby hang from the pencil-thin twigs like strange, half-animated fruits.

Chiarello’s “main actress,” as he fondly refers to the mother sloth, is the star in his study, funded in part by the National Geographic Society, of the endangered mammals of the São Lourenço Municipal Park, a small fragment of Brazil’s Atlantic forest, or Mata Atlântica as the Brazilians call it. Like many mammals here, the maned sloth has lost huge tracts of its original habitat since the first Portuguese mariners stepped ashore in April 1500. At that time the Mata Atlântica is believed to

### H O T S P O T S

The Earth’s richest and most threatened reservoirs of plant and animal life

#### ATLANTIC FOREST

AREA 35,500 sq mi

#### HABITAT TYPES

Tropical and subtropical forests on coastal plains, foothills, and mountain slopes up to 6,500 feet

#### FLAGSHIP SPECIES

Lion tamarins, maned sloth, muriqui monkeys, Alagoas curassow, araucaria tree

#### ENDEMIC SPECIES

8,000 plants, 188 birds, 90 mammals, 60 reptiles, 340 amphibians

#### PRINCIPAL THREATS

Agriculture, urbanization, industrial pollution, hunting, and collecting





## Threadbare Shawl of Green

**Covering less than 7 percent of its original 520,000 square miles, the Atlantic forest lies besieged by human sprawl yet still harbors a staggering variety of life. One study found more than 450 tree species—a larger number than in all of Germany—in just two and a half acres.**

have covered about 520,000 square miles, making it about one-fifth the size of the present Amazon forest 500 miles to the northwest. The rain forest hugged the coastline from the country's snout-like protuberance of what is today the state of Rio Grande do Norte to its border with Uruguay. In some places it extended inland for 300 miles or more, covering a range of habitats from coastal mangrove thickets to mountain massifs averaging 3,000 feet high, blanketed with broad-leaved evergreens and conifers.

Forebodingly, one of the first things the Portuguese seafarers did was to chop down a tree. They fashioned a cross from it and celebrated a Mass, claiming the land and its forest for their God and king. Over the next 500 years many more trees were felled, and the forest was transformed into cities, mines, and fields planted with sugarcane, coffee, cacao, and eucalyptus—all introduced species. Now, some 70 percent of Brazil's population lives in what was once the Atlantic forest, with most people concentrated in two of the three largest cities in South America, São Paulo and Rio de Janeiro.

Given that history of destruction, it's not surprising that today less than 7 percent of the Atlantic forest remains, much of it in isolated patches, some less than six acres in size. It's as if someone broke apart a strand of pearls, then stepped on each bead. Indeed, among biological hotspots—the environmentally threatened regions of the world with the highest amount of endemism, meaning species found nowhere



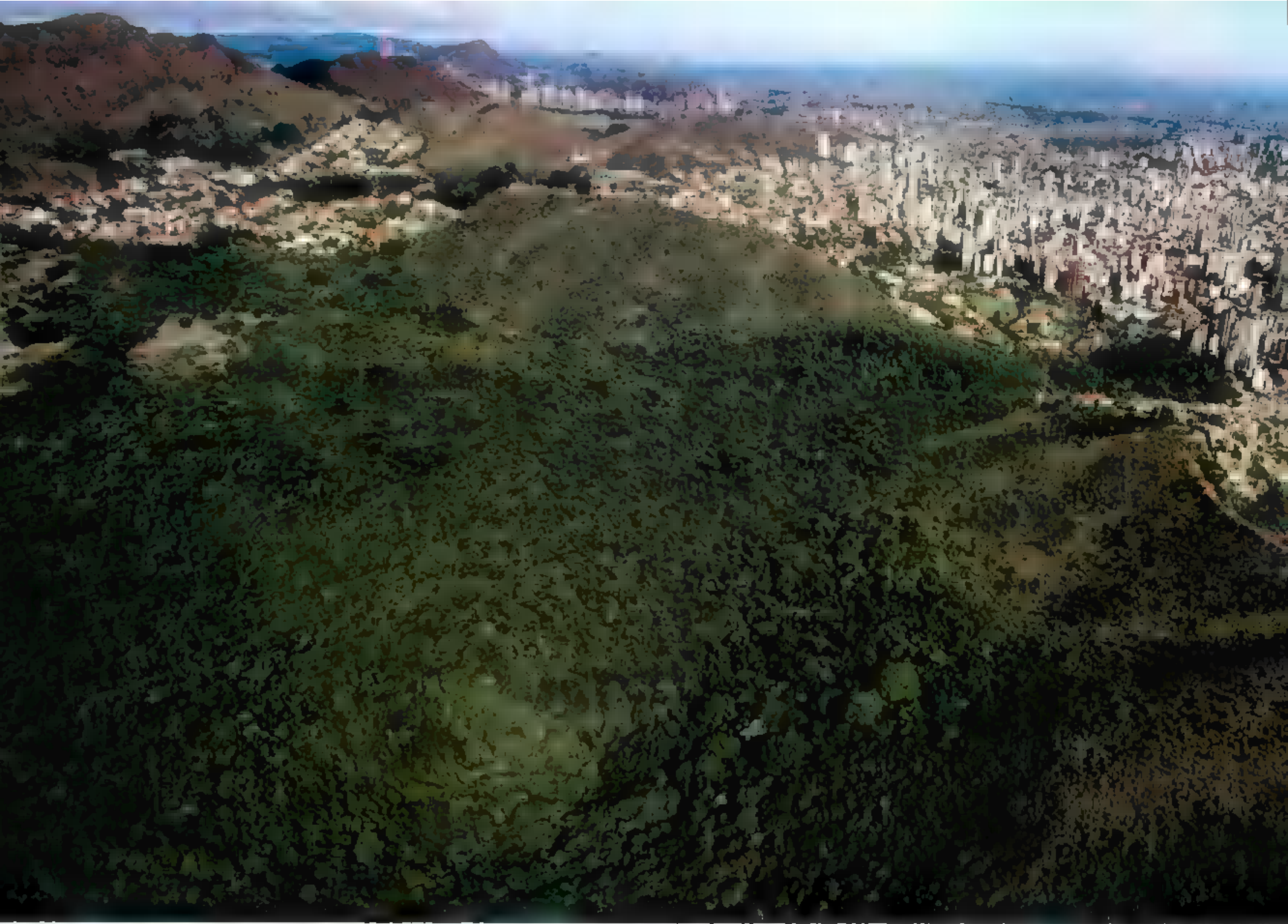
else on the planet—Conservation International ranks the Atlantic forest as one of the top five.

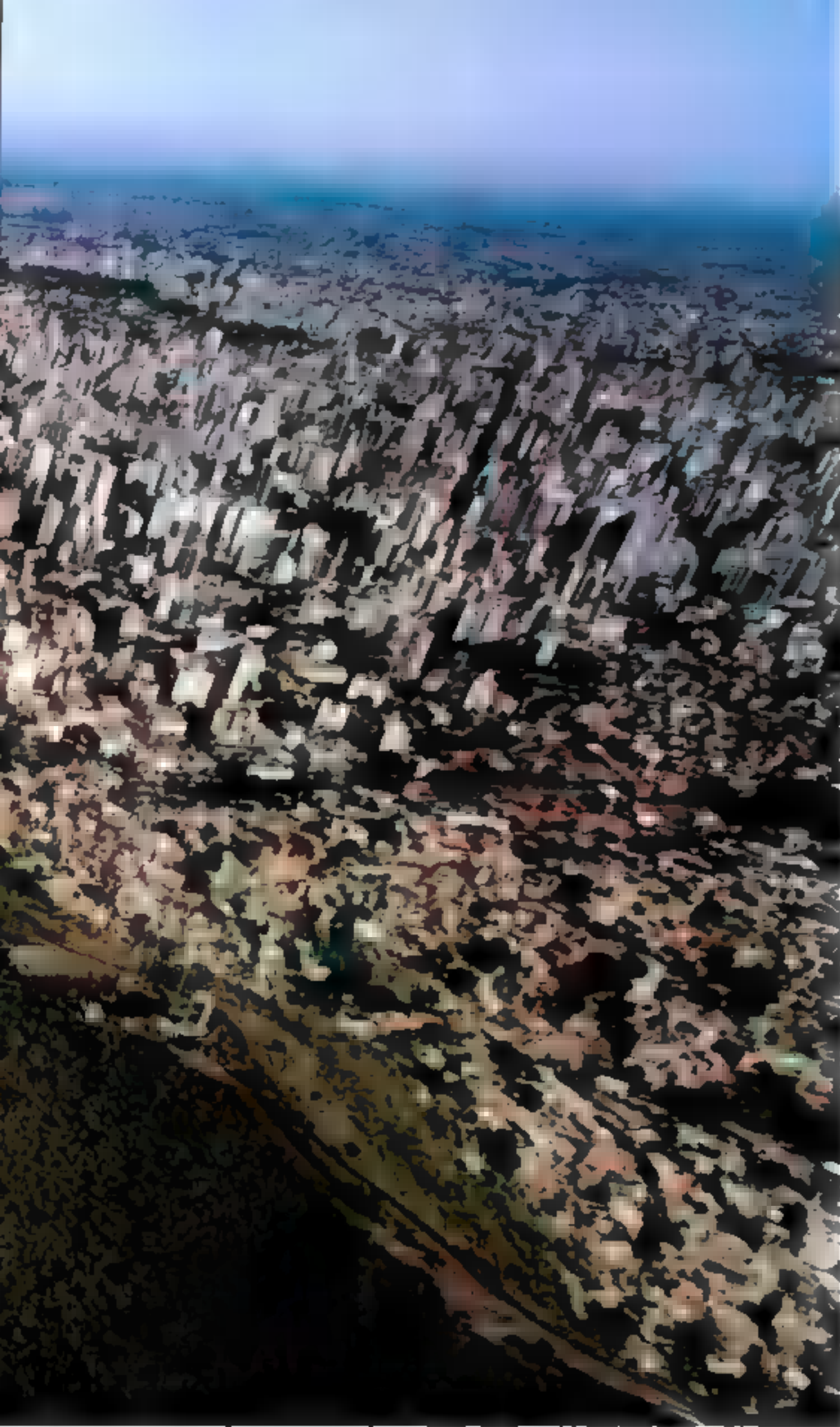
Yet within those fragments many of the Mata Atlântica's unique species, including some of the world's rarest plants, birds, and other animals, have managed to survive. Among them is the maned sloth. Like other mammals stranded here on forested islands amid a sea of agriculture and development, the sloth seems doomed to genetic inbreeding—if not eventual extinction.

"We think the sloths' genetic variation has already decreased," Chiarello says. "In the past this population was connected to those in southern Bahia and northern Rio de Janeiro. But they've been separated for at least 50 years." To determine the amount of inbreeding in the three groups, one of Chiarello's students, Paula Lara Ruiz, has launched a study of their genetic makeup.

"We may need to relocate some sloths to maintain their viability," Chiarello says. "Before we can do that, we need to know what trees they prefer, how much deep forest they need to survive."

But nailing down the particularities of sloths is only a small part of what Chiarello has in mind. Like other biologists tracking species in the Mata Atlântica, he has a far grander vision. Never mind that some of the land around the fragmented forest has the look of an abandoned bombing range, or a Sahara-in-the-making. Never mind that farmers continue to expand their eucalyptus and coffee plantations. Chiarello and a growing coterie of conservationists are





## Big Losses

**Skyscrapers tower in place of trees in Belo Horizonte, Brazil's third largest city, where the population has exploded from 385,000 in 1950 to more than four million today. A park holds the line against expansion to the south (left). In Espirito Santo, stacked eucalyptus logs await pickup. Plantations of this non-native species have replaced 7.5 million acres of forest, becoming the world's biggest source of eucalyptus pulp for paper.**



determined to bring back the Mata Atlântica by reconnecting as many fragments as they can.

By linking islands of natural landscapes with corridors of vegetation, these scientists believe the Atlantic forest can be partly restored and many of its species saved from extinction. The corridors, in essence, could provide a safe passage from one island to the next, enabling isolated populations of animals and birds to meet and mix. It's an idea that has been around since the 1960s. Although there's no absolute proof that corridors ensure a species' survival, they are currently being tested around the world, with projects under way in the Netherlands, Australia, the United States, and many other countries. "It just makes intuitive sense that corridors are beneficial," says Hugh Safford, an ecologist with the U.S. Forest Service who has worked extensively in the Mata Atlântica. "Any planting to restore a forest has to help."

In Brazil one goal is to develop a corridor that would link broken bits of forest along 500 miles of southeastern coastline, including both new forest and existing agriculture. Though native trees are preferable, just about any type of tree or shrub can be incorporated into a corridor. "Animals use the coffee and eucalyptus plantations to get from one fragment to another," says Chiarello's colleague and fellow mammalogist, Marcelo Passamani. Conservationists want farmers and ranchers to maintain plantings they already have and to join these with replanted stands of native trees. But is it really possible to bring back a rain forest?

"Theoretically, it can be done," says ecologist Rejan R. Guedes-Bruni, coordinator of the Atlantic Forest Program at the Botanical Garden of Rio de Janeiro. Every year since 1993, the Botanical Garden has (Continued on page 16)



## Last Stand?

For more than a million years a primitive amaryllis has brightened mountainsides now just 30 miles removed from Rio de Janeiro. Weeks after this photo was taken, a farmer's fire charred this site, wiping out 90 percent of the species. "It's an interesting question," says Gustavo Martinelli, a scientist at Rio's Botanical Garden Research Institute. "The species has endured on a geologic timescale. Can it survive modern civilization?"





BRADYPUS TORQUATUS (MANED SLOTH)

## S M A L L V I C T O R I E S

Help arrived just in time for animals pushed close to extinction as their habitat all but disappeared. Roberto Azeredo (below), president of an institute that breeds Alagoas curassows near Belo Horizonte, hopes to release his birds in a restored section of the forest one day. In the late 1970s a concerned naturalist gave refuge to five of the last six known birds in the wild. Since then breeders have increased their number to 80. Highly social northern muriquí monkeys huddle near the Caratinga Biological Station (right), where a 2,365-acre reserve protects them. In two decades their population there has quadrupled to 200—almost half the remaining members of the species. At a rehabilitation center near Ilhéus, Vera Lúcia de Oliveira soothes maned sloths rescued from hunters. This elusive creature becomes an easy mark when it wanders into the open. "The destruction of the forest," says Oliveira, "means the annihilation of these animals."

ARATUCAITU ALAÇÓAS CURASSOW



BRACHYTELES HYPOXANTHUS (NORTHERN MURIQUI MONKEY)



## The tamarins are so at home in the forest that I have should be here, but they came so close to extinction

overseen the planting of some 30,000 seedlings. "Of course, it's very difficult," she says. "But it is not too late to try this, and so we are doing it."

**T**o get an idea of how much of the Atlantic forest has been destroyed, one has only to look at maps of the area. On many of them the forest is shown as dark splotches of green among the lighter greens and browns that depict agriculture, or the red swaths representing cities. In southeastern Brazil, along the coastline where the Mata Atlântica is most intact, maps typically show a broad stroke of deep green. But around the city of Rio de Janeiro and in the northern state of Bahia, the darker shade gives way to large patches of olive, sage, beige, and red. In many places on the maps, only specks of the richer green remain.

In one of those specks, about 60 miles from Rio, I join Marina Lapenta, a wildlife biologist with the Golden Lion Tamarin Association, as she and her assistant search for a group of radio-collared tamarins. The speck is named the Poço das Antas Biological Reserve and covers some 13,600 acres, about half forested. The rest will be, too, if the association has its way. Plans are afoot to connect the reserve to forested plots on nearby ranches via corridors that would nearly double the size of the tamarins' habitat here.

"All of this is secondary forest," Lapenta says, as we make our way through a tangle of vines, thorny palms, and spindly broad-leafed trees—the kind of trees and plants that sprout after an old-growth forest has been cut. Her assistant, Jadir Ramos, turns his radio antennas in a slow arc, homing in on the tamarins' signal. "They're coming this way," he says.

Right on cue, the air suddenly fills with the tamarins' high-pitched whistles, clucks, and warbles. They spy us and make a sharp alarm cry, then leap into the uppermost branches of a tree with such speed they look like flying cats. For a moment there is only a blur of red-orange, silky fur. Then curiosity gets the better of them, and they inch closer to peer down at us. "They'll get used to us," whispers Lapenta. "But they're nervous because another group is coming this way."

In the distance we hear the other group's whistles and clucks, and the tamarins turn to face the sound. Looking something like a miniature samurai warrior with his slightly Asian-tilted eyes and mane of sunset orange fur, the oldest male jumps into a neighboring palm, positioning himself to meet the challengers as they move closer. "This is a way for females to meet mates too," says Lapenta. "Sometimes a male and female go off to form a new group."

But neither love nor war is in the cards this morning. The oldest males from each group eye each other, then resume their feeding, picking out juicy bugs from beneath the fronds' fibers. The tamarins are so at home in this setting that I have to remind myself that all the animals busily hunting, chirping, and socializing shouldn't be here—or rather, they should be here, but they came so close to extinction 40 years ago that their presence today is akin to a miracle tale. By the 1960s only 150 individuals remained in the wild. The tamarins' forest had been reduced to shreds, and ranchers still actively captured and sold the surviving primates.

"Then 20 years ago this project started," says Denise Rambaldi, director of the Golden Lion Tamarin Association. "In 2001 we celebrated the thousandth birth of a tamarin in the wild."

Supported by more than 30 Brazilian and international organizations (including the National Geographic Society), researchers have used some of the most intensive, hands-on measures in conservation biology to achieve success. Tamarins were carefully bred in several zoos in the United States and Europe, taught to forage for wild foods, then relocated to the reserve and nearby ranches that offered protection. Poachers were actively pursued, and an environmental education program was introduced—with such success that locals today proudly ask if you've seen "their" golden lion tamarins. Ranchers, too, were given financial incentives to protect the forest and tamarins on their lands. At the same time, conservationists began to reforest the reserve.

"It's not a manufactured, 'fake' forest," emphasizes Luiz Fernando Duarte de Moraes, a restoration ecologist with the Atlantic Forest



## to remind myself they shouldn't be here—well, they that their presence today is akin to a miracle tale.

Program at the Botanical Garden of Rio de Janeiro. Fernando leads me on a tour of a young forest corridor covering about ten acres. "The forest grows naturally. We're just giving it a hand." He shows me the willowy sprout of a jacaranda tree. "This is not one we cultivated. It's actually a very rare species. But its seeds were here in the soil. It returned on its own." The tamarins are returning too. "They're already coming into these trees to hunt. So that shows they will use these corridors. Meter by meter, we're expanding their habitat," he says.

Indeed, the success of the Golden Lion Tamarin Association is one reason conservationists have turned to corridors as the method of choice for saving the Mata Atlântica's highly endangered species. "There's so much to save," says Marcelo Passamani. "Rare birds, rare plants, the tamarins, muriquis [woolly spider monkeys], wild dogs, jaguars, peccaries, and tapirs, even little rodents."

Until the 1980s few grasped how unique the forest was. "We ignored the urgency of studying the forest before then," says Guedes-Bruni. "Partly, we felt we could study it anytime, because most Brazilians live right next to the Mata Atlântica. And part of it was our attitude. People didn't call the forest *mata*. They called it *mato*—unproductive land that needed improvement."

Thus devalued, the forest was steadily eroded. Only after researchers began to inventory its remaining species in the 1980s did they realize that the Mata Atlântica came close to the Amazon in terms of endemism. And although today's Atlantic forest is only a small fraction of the size of the Amazon, it supports about two-thirds as many mammal species—269, while the Amazon has 427. This new awareness gave birth to a growing environmental movement. In the early 1990s, when about 8 percent of the forest remained, the Brazilian government finally issued a decree banning all further cutting of native species in the Atlantic forest.

"We have some good laws," says Rambaldi. "Ranchers must keep 20 percent of the forest on their lands, for instance. But no one enforces the laws. It's true that it's now rare to see clear-cutting, but people still take a few trees here,

a few trees there. That's what's destroying the last of the Mata Atlântica—this nibbling."

Farmers typically burn their fields after harvesting their crops, and these fires also eat away at the forest—and the newly planted corridors. At Poço das Antas, a few miles from where we watched the tamarins feeding in the palms, a fire had been burning for more than a week, consuming trees and shrubs.

"It takes time to change peoples' attitudes," says Guedes-Bruni. "And we need to make big changes. The problem is, the forest is being destroyed faster than we can change."

**S**ometimes, however, changes do come, and in unlikely ways. In the state of Alagoas, in the northeastern part of the Mata Atlântica where barely 2 percent of the forest remains, the Serra Grande sugar company is the region's leading proponent of reforestation and conservation.

"I never expected to find a forest like this here," says Marcelo Tabarelli, an ecologist from Federal University of Pernambuco in Recife who is working with the company to increase the forest on its land. He and two of his students lead me along a boggy trail from a sunny sugarcane field into the twilight of a dense forest. "This forest has never been cut," he says. "You can tell from the size of the trees, the big liana vines, the number of bromeliads and orchids."

He stops beside one soaring tree with a girth easily ten feet around. Bromeliads as big as truck tires splay from the tree's muscular branches, and lianas as fat as overfed pythons wind down from its sky-high crown. "I'm sure this tree is at least a thousand years old," he says. "It's remarkable to find a tree of this age anywhere in the Mata Atlântica, but especially here."

This was one of the first parts of Brazil to be settled, and most of the forest was turned into sugar plantations and cattle pastures long before a naturalist ever visited. "This is the rarest, most endangered part of the Mata Atlântica. It's like being on a scientific frontier. We're always discovering new species—frogs, bromeliads, trees, shrubs, an owl, even a bee," says Tabarelli.

Somehow, even as the (Continued on page 22)



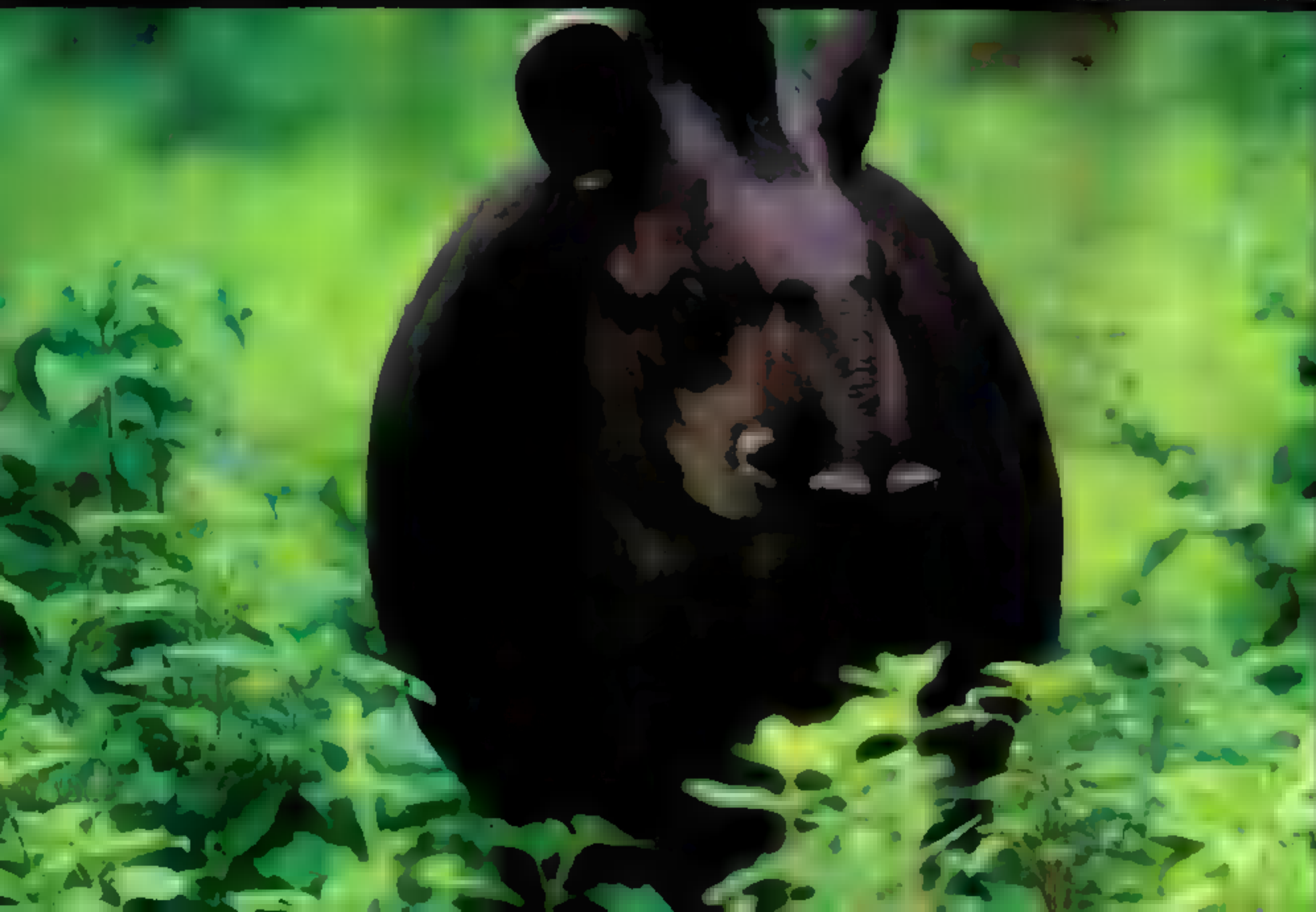
## Snake Island

Danger lurks everywhere on Queimada Grande, the only home of the deadly golden lancehead. As University of São Paulo researcher Marcio Martins snags one snake with a gripper pole, another slithers along mossy trees. "You have to be alert to avoid stepping on them," he says. The golden lancehead likely became a separate species after its realm split from the mainland about 10,000 years ago. It eats birds, which it immobilizes in seconds with the fastest acting venom of any South American viper.





*TAPIRUS TERRESTRIS ITAPIRI*





TANGARA CYANOVENTRIS (GILT-EDGED TANAGER)

## SHARED SPACE

Hoping the government will give them part of an abandoned cattle ranch, José and Carmosina Costa (left) and 81 other landless families have built houses on the site. Close by lies the Poço das Antas Biological Reserve, home to the rare golden lion tamarin and a rainbow assortment of birds like the gilt-edged tanager (above). Supporters of the squatters believe they can learn a low-impact lifestyle. Critics say they leave trash, often hunt and cut firewood illegally, and carry out slash-and-burn farming. In the state of Alagoas, the Serra Grande sugar company shows that human endeavor can restore what it previously destroyed. To protect the watershed, it preserves forest on more than a third of its 60,000 acres. Some parcels cover several thousand acres, others run as corridors between fields of golden-flowering sugarcane (below). The company sponsors captive breeding of species such as the tapir (bottom left), an important disperser of fruit seeds.



land was changed from forest to an almost endless sea of sugarcane, this parcel—about 9,000 acres—survived intact. “It’s here because the sugar company needs water for its fields and generating electricity. And its managers know that forests are necessary for a healthy watershed,” says Tabarelli. Altogether the company has some 27,170 acres planted in sugarcane and another 22,230 acres of forest.

Although the sugar company essentially saved the forest out of self-interest, it prides itself on what it has conserved. “There’s forest here today because the company protected it,” says José Bakker, the physical plant manager and company liaison with Tabarelli. “When I came here in 1986 the forest was like an empty house. There were a lot of trees but very few birds and mammals because of the poaching. I wanted to bring back its inhabitants.” Working with conservation groups, Bakker reintroduced capybaras into some of the forested fragments and plans to bring in tapirs and peccaries.

For his part, Tabarelli is skeptical that corridors are the answer to saving the forest here. Often, he notes, corridors are simply too narrow to be of use to animals that live in the deepest regions of a forest. “We can’t wait to find out if corridors—even though they’re the newest paradigm for conservation here—will save species,” says Tabarelli. “We’re trying some. But I think our best shot is first to increase the overall size of the forests we have. Where you have good, dense forest, you have more species.” Tabarelli hopes to do that by planting trees around the fragments’ edges rather than connecting them with corridors. To that end, the sugar company (in alliance with conservation organizations) is planting 130 acres of forest a year.

The tragedy of the Mata Atlântica is that so much of its biodiversity has already been lost. Indeed, four animal species known to have recently become extinct in Brazil all lived in the Atlantic forest. Because of the scale of loss, conservationists agree that the Mata Atlântica will never be fully restored—no matter how many corridors are planted or fragments enlarged. “What we can do is stop the destruction to save what remains,” Tabarelli says. “And increase the forest where we can.”

“Yes, maybe this can be done,” says the ecologist Guedes-Bruni, who admits to being pessimistic about any larger plans to bring back

## Small Wonder

**Not quite a true porcupine, not really a spiny rat, the thin-spined porcupine has no close relatives anywhere in the world. Feared extinct until scientists rediscovered it in the 1980s, this curious creature offers hope that other unique species can find shelter deep in the forest’s remaining shadow.**

the Mata Atlântica. “I would never tell my students I am doubtful, because they are full of hope, and they might make a big change.”

For now the students and researchers like Tabarelli are intent on deciphering from the forested fragments how a “real rain forest”—one with trees a thousand years old and stretching miles instead of acres—works. In one medium-size fragment above a recently harvested sugarcane field, we hike a short way beyond the forest’s edge to meet two students who’ve tacked paper disks to several tree trunks. They’ve scented each disk with the odors that different orchid species use to attract male euglossine bees.

“That’s how we found a new bee,” says Evelise Locatelli. “It came to this scent.” She opens a vial and wafts its malodorous brew toward my nose. I take a step back as a blend of mildew, stinky gym socks, and chlorine hits my nostrils. “My new bee loves it,” she says, laughing as I wrinkle my nose. “Wait until you see him. He is beautiful!”

Locatelli touches more of the scent from the vial to the disk, and her newest discovery soon arrives. It zooms in straight toward the reeking disk; Locatelli’s colleague captures it quickly in a butterfly net. She gently untangles this male, whose throbbing thorax is shaded cinnamon and green. “It’s really his color and small size that told us he was something new,” she says. “So now we want to know, where do these bees live? How far do they travel? Do they like only the big forest, or can they live in the small bits and corridors too? Many questions!”

They’re the questions every researcher in the Mata Atlântica wants to answer for his or her favorite species. It’s what they need to know as they set about restringing, pearl by pearl, the broken necklace of the Atlantic forest. □

**WEBSITE EXCLUSIVE** Hear photographer Mark Moffett narrate the *Hylodes asper* frog’s high-kicking courtship dance at [nationalgeographic.com/magazine/0403](http://nationalgeographic.com/magazine/0403).



BY MARK W. MOFFETT

I've been crazy about frogs since I was a kid. I collected them along with snakes, ants, and other critters, and even joined the Wisconsin Herpetological Society as a charter member—at age 14. Now, as a zoologist-photographer, I get to combine my two great passions. For a guy like me, an assignment to cover Brazil's Atlantic forest was a ticket to . . .

# Frog heaven

By a stream on the island of São Sebastião, a frog's fevered leap made me the key prop in an amphibian romance. I didn't see it coming, though. For hours I'd been crouching in the cold, rushing water to capture the foot-flagging mating dance of a male *Hylodes asper*. Swarms of the island's infamous blackflies, called *borrachudos*, bored into me as the frog whistled his mating call and danced his heart out. When a female showed up, I suddenly found myself in the middle of the drama. Oblivious to anything but the urge to get closer to the male, his future mate hopped onto my leg as if it were a rock (below). I focused on my business, the frogs on theirs, and soon the passionate pair jumped into the water to find some privacy in the stony streambed.

When I was growing up, I dreamed of having the kind



CLAUDIO E. G. PATTO





The illusion of a rival puts a poisonous pumpkin toadlet (*Brachycephalus* sp.) on the attack—against himself. “Finding this gem of an animal is magical,” says Brazilian zoologist Célio Madson, who holds the mirror.





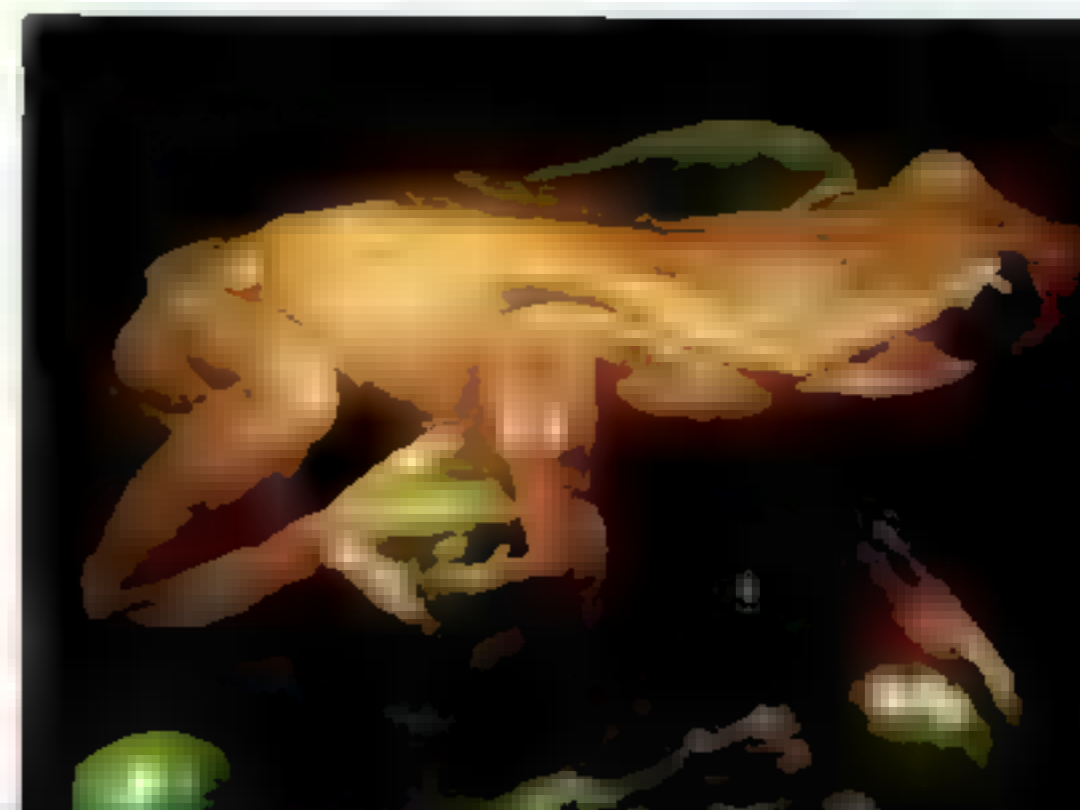
of grand adventure that would put me on intimate terms with nature. The exploits of naturalists like William Beebe and Charles Darwin filled my childhood fantasies. Now, I am following in their footsteps.



Like them, I face more than a few challenges. Secretive behavior makes some frogs tough to find. The world's smallest frog, *Brachycephalus didactylus*, hides in debris on the forest floor. For two days three Brazilian frog experts helped me sift through leaf litter to look for a flash of brown the size of a fingernail. As we were about to give up, we found one—just one—which I photographed on the cheek of a colleague (page 2). *Xenohyla truncata*, the only frog in the world known to eat fruit, was hard to catch and even harder to catch feeding. I watched one for two days straight, but it ate nothing.

I began this trip with a list of frogs I wanted to photograph, and I'm proud to say I found every one of them. That wasn't easy in a forest that conceals more than 370 known species—and many others awaiting discovery. □

Dancing a courtship cancan, a *Hylodes asper* repeatedly kicks right and left (above) to mark his streamside territory and attract mates. The *Phasmahyla guttata* tadpole (left) wears its mouth like a hat, allowing it to skim food from the surface of mountain streams. *Xenohyla truncata* (below)—the world's only frog that eats fruit as well as insects—lives near the beaches of Rio de Janeiro. And *Scinax arduous* (far left) lays its eggs in water caught in cupped bromeliad leaves.



# Armenia

the rebirth of  
For 3,000 years Armenians have weathered calamities from wars to earthquakes. Independent since the Soviet Union's collapse, they're rising from the ruins—again.



Dancing near Khor Virap in Armenia, Celia Kahvejian celebrates the 1,700th anniversary of the baptism of King Tiridates III. With the king's conversion from paganism, Armenia became the world's first Christian nation.







*Each day in Yerevan, Armenia's capital, locals can gaze at Mount Ararat but can't go there. Since 1920 Turks have controlled this national icon—where the Bible says Noah's ark came to rest—on the other side of a border officially closed to Armenians.*

By Frank Viviano

Photographs by Alexandra Avakian

**We had purchased four maps,** with four radically different versions of the route to Amaras, on the assumption that one of them might bear some slim connection to reality. Gevorg Melkonian, a veteran guide to the remote backcountry of the Caucasus, pulled the car over every half hour, and we stared at the maps in turn, trying to make sense of our location.

It was a hopeless task. All four maps were exercises in fiction, and every road sign had been blasted into illegible shreds by shrapnel and tank fire. In the end we relied on dead reckoning, lurching south at a seven-mile-an-hour crawl through occasional mud holes so deep and slick that Gevorg's Russian-manufactured four-by-four spun in 180-degree fishtails.

At the village of Majkalashen, a lone farmer turned up mounds of rich black soil amid vineyards in April bud and cottony orchards of flowering apricot, his waist and shoulders hitched to a plow mule. The landscape might have been lost to time had it not been for an International Red Cross marker less than 300 yards from the farmer. "Minefields," Gevorg explained.

This is the insurgent nation of Nagorno-Karabakh: forever Armenian in the eyes of its 130,000 embattled residents. A breakaway province of Azerbaijan, according to international law. An independent state since 1991 by its own unilateral declaration, diplomatically recognized by no foreign government. And the setting of a six-year conflict that killed as many as 25,000 Azeris and 5,000 Armenians

before an uneasy truce, still broken regularly by gunfire, was declared in 1994.

This is also the template of Armenian history, a 3,000-year chronicle of defiance and survival.

Two hours beyond Majkalashen we crested a ridge and wove down earthen switchbacks into the Amaras valley. The fourth-century Monastery of St. Gregory the Illuminator, the patron saint of Armenians, stood above a creek bed, utterly deserted, engulfed in the silence of gnarled mulberry trees.

We climbed through an aperture in the bullet-riddled stone rampart that surrounded the monastery. The rampart's inside wall had been fitted with cells for the monks; it took very little imagination to visualize them steadily transcribing texts and teaching the classics of antiquity to novitiates. The monastic complex at Amaras housed the first school established by Armenians in Karabakh, a foundation shrine of their educational traditions and written language.

The monastery's later annals are a catalog of







**Future Tense** *New high school graduates en route to a party in Yerevan ponder the road ahead. Competition is fierce for admission to universities, and unemployment reaches 20 percent. “My hopes for a happy future,” says Kira Melkumova, at center, “may lead me out of Armenia.”*

desecrations. It was sacked by Persians in the fifth century, Arabs in the seventh, and Genghis Khan’s Mongol warriors in the thirteenth. A century and a half later came Tamerlane, riding a furious wind of conquest from Samarkand to the Mediterranean; determined to outdo the Mongols, he razed the entire complex and had its stones thrown into a river. According to oral tradition, the surviving monks waited until Tamerlane was out of sight, then pulled the ruins from the water and rebuilt their monastery, stone by stone.

I took the tortuous road to Amaras because its monastery had played a key role in the Armenians’ distant past. But Nagorno-Karabakh also spoke directly to the 21st century. The rebellion against Azerbaijan was the first of the deadly conflicts to erupt in the ruins of the Soviet Union as its empire disintegrated, the first

post-Cold War war, fought on the battlefields of ethnic nationalism and antipathy that have redesigned the world’s map in the past decade.

In Stepanakert, Karabakh’s largest city, Azeri forces had hit the central high school with “19 missiles, 4 heavy artillery shells, and 9 bombs,” Karen Andreyan, the principal, told me. We visited a classroom where 15-year-olds in a compulsory military training program demonstrated their speed taking apart and reassembling Kalashnikov assault rifles. They were down to an average of 20 seconds.

Andreyan was proud of them. But he was prouder yet that the school had remained in operation throughout the war. “We taught literature classes, music, math, science, history, and geography in underground tunnels.”

A very old story, Armenians will tell you. Armenia’s early contemporaries—the Hittites and



A thousand years before  
Christ, the theme of  
survival was central to  
Armenian identity.

With pomp and piety, Armenian Apostolic bishops from around the world gather to consecrate Yerevan's new Cathedral of St. Gregory the Illuminator — a sign of the church's rebirth after 70 years of Soviet repression.



# Armenia: An Empire's Shrunk Shadow



In 70 B.C. Armenia was an empire (inset). Today it is a tiny republic squeezed by Azerbaijan and Turkey, historically hostile neighbors that have closed their borders with Armenia. The current dispute: ethnic Armenian control of Nagorno-Karabakh, an enclave within Azerbaijan.

the Chaldeans, the Phoenicians and Phrygians, the Lydians and Medes—vanished long ago. But the Armenians are still present. The longer I traveled among them, the more I recognized that my journey was an inquiry into an ancient drama—the cycle of disaster and regeneration embodied in the tale of Noah, whose ark, according to the Old Testament, came to rest in Armenia after the Flood.

At every turn in the Armenian landscape, the echoes of that primeval drama can still be heard. History for Armenians has never been a matter of detached experience, lost in the currents of change. It is an unbroken cultural memory that reaches back three millennia, an identity so tenacious that it has weathered every imperial rise and fall from Babylon to perestroika.

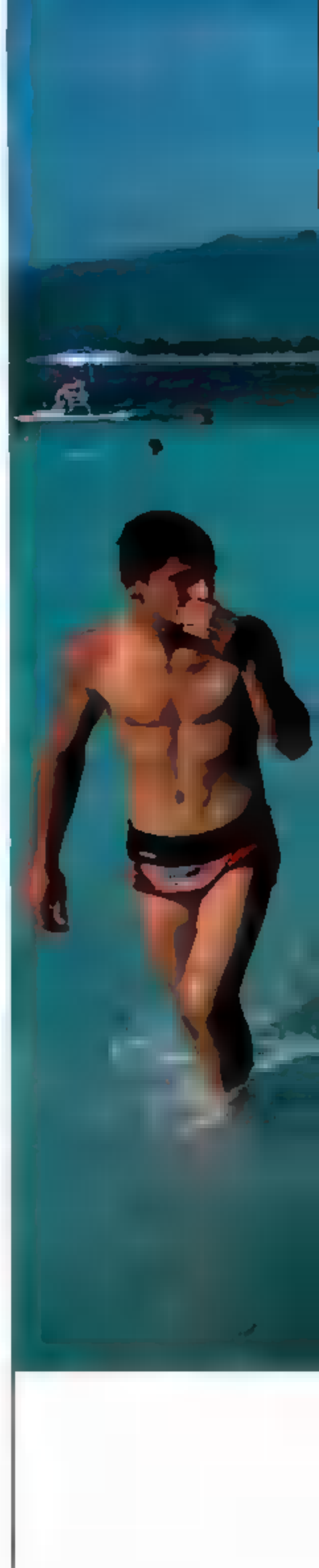
Inscriptions in old Persian make the earliest recorded allusion to a land known as Armina in 518 B.C. But under their own name, the Hai (even today, in Armenian, the nation is called Hayastan), they had settled in what is now known as the Caucasus and eastern Anatolia

centuries earlier. Legend has it that the Hai are descended from a renowned archer, Hayk, a great-great-grandson of Noah who escaped the doomed city of Babel before its celebrated tower fell.

Already a thousand years before the birth of Christ, the theme of survival is central to the Armenian identity. Already its origins are shrouded in antique mists. After that the mists only grow denser, and the saga of Armenian longevity becomes a riddle. What is Armenia?

The straightforward answer in the year 2004 is that it's a nation of three million citizens in the southern reaches of the Caucasus Mountains, 11,500 square miles of stony highland roughly the size of Belgium or Maryland. Landlocked and earthquake ridden, it lies squarely on one of history's most venerable trade routes—the land bridge from Europe to Asia—now bordered by Turkey, Georgia, Azerbaijan, and Iran.

But the borders of *this* Armenia only date back to 1921, when Soviet Russia annexed part





**Hot Spot** *A cool dip isn't as deep anymore at Lake Sevan, which holds 80 percent of Armenia's water. Its volume has dropped by almost half since 1933, when the Soviets first tapped it for hydro-power and irrigation. In an attempt to replenish Sevan, a river has been diverted into the lake.*


of a short-lived republic that was born in the ashes of World War I, allotting Nagorno-Karabakh to the Soviet Republic of Azerbaijan and establishing the current Armenian capital at Yerevan. For the previous five and a half centuries, Armenia did not even exist as a state; it was a geographic term with little political meaning, referring to a people who had been parceled out among the territorial claims of the Ottoman Turks, the Persians, and the Russians.

Turn the historic clock back to the epoch of Julius Caesar's Rome, the first century before Christ, and Armenia is an empire under Tigranes the Great, whose realm extends from the Caspian Sea to the Holy Land. Turn it forward again, to the ninth century, and the giant Armenia of Caesar's day has been carved up into provincial satrapies of Byzantium and the Arab caliphate. Then come the relentless Turkic

invasions that gradually loosen the Byzantine grip, and in a development that would seem utterly implausible for another nation, the Kingdom of Armenia effectively packs its bags in the 12th century and moves several hundred miles west to the region of Cilicia along the Mediterranean coast.

Eight centuries later, in 2001, two French academics published a historical atlas intended to make cartographic sense of Armenia's constant metamorphosis. The task required no fewer than 60 separate maps, yet the authors still felt obliged to apologize for a lack of precision.

The sole constant in their atlas is the towering presence of Mount Ararat, the geographic fulcrum on which all the maps turn, the centerpiece of Armenia's collective imagination. As a Turkish military zone, it is strictly off-limits to Armenians.

A group of young people, likely models, are shown in profile, looking towards the right. They are wearing dark, possibly black, clothing. The scene is dimly lit, with a warm, reddish-orange glow. In the foreground, a model is wearing a white wedding dress with a large, ornate floral or lace-like pattern. The background shows a balcony with a white railing. The overall atmosphere is dramatic and artistic.

“We worked, always, toward the very highest international level. That was the only way doors would open for us.”

*Letting her imagination—and scissors—run wild to craft this model’s wedding dress, Liana Sargsian — one of the young Armenians challenging tradition. “Fashion,” she says, “is a world where I can create boundlessly.”*



**“We are not place bound”—an impossibility, given Armenia’s ceaseless traumas—  
“but we are intensely place conscious.”**

**Y**ou are looking at the great Armenian paradox,” Jivan Tabibian said. We stood at the second-floor window of the Foreign Ministry building in Yerevan, watching clouds scuttle across the mountain’s ice-capped 16,854-foot crown. Tabibian, a diplomat whose portfolio includes ambassadorships to four countries and two international organizations, was discussing a policy initiative when he abruptly fell silent, gazing at Ararat in Yerevan. Despite its enormous mass, the great peak seems to float weightlessly over the city, engaged in permanent dialogue with Little Ararat, its 12,782-foot neighbor.

The vast snowy brow of Ararat glowers, pronounces, with hallucinatory power. Its name is derived from that of a Bronze Age god, Ara, whose talismanic cult of death and rebirth mirrored the seasonal transitions of Ararat from lifeless winter to fertile spring. Little Ararat, by contrast, is an exercise in calm, rational idealism, a volcanic cone so perfectly shaped that it suggests not so much what a mountain is as what a mountain ought to be.

You can’t ponder the two Ararats for long without drifting into philosophical reflection, and the Armenians have been pondering them since the birth of civilization.

The philosopher in Jivan Tabibian maintains that his people’s identity is inextricably bound to the experience of loss, to the serial reorderings of the map that have often stranded their most hallowed landmarks in someone else’s state. Like the Monastery of St. Gregory the Illuminator deep in the hills of Nagorno-Karabakh, Mount Ararat lies outside the contemporary Armenian Republic, beyond the closed frontiers of a hostile Turkey.

“The paradox embodied in that mountain,” Tabibian said, “has to do with our sense of place,” the concept that is so essential to most national identities. “We are not place bound”—an impossibility, given Armenia’s ceaseless traumas, metamorphoses, and peregrinations—“but we are intensely place conscious.”

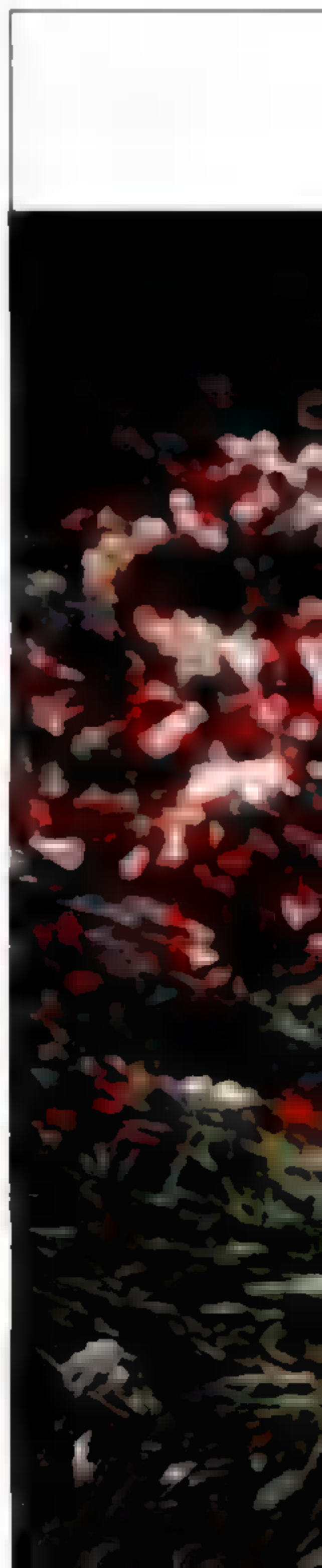
Later I repeated Tabibian’s enigmatic words

to Vartan Oskanian, the Republic of Armenia’s foreign minister. And he too offered a philosopher’s reflection on Ararat. “Every morning we look at it,” he said. “It’s only 25 miles from this building, and we feel we can almost touch it. But we can’t go there. Ararat is our pride and our frustration. Our history. The unfulfilled dreams that drive us.”

The paradox of Armenian identity may be even more acute for those who do not watch the sun set over Ararat each evening; the diasporans who account for four million of the estimated seven million Armenians alive today. As a foreign correspondent, I had chanced on their churches or tombstones in Singapore and Hong Kong, Cairo and Jerusalem, Moscow, Venice, and Naples. There are Armenian enclaves in Ukraine, Romania, Bulgaria, and Poland, Armenian-owned vineyards in California, Armenian pop stars and intellectuals in New York City and Paris.

Most are descendants of the greatest catastrophe in their people’s history: the WWI-era massacres in the Ottoman Empire that were the murderous 20th century’s first major experience of genocide. Ostensibly provoked by a militant surge of Armenian nationalism against the repressive Ottoman government—and despite the fact that tens of thousands of Armenians were loyally serving in the Ottoman army, which was allied with Germany—the government crackdown in 1915 grew into an organized effort to exterminate an entire community.

In 1913 the empire had an





Armenian population of about two million, according to parish records of the Armenian Apostolic Church. Fewer than 100,000 remained in 1920. Estimates of the dead in what is now Turkey range from 600,000 to 1.5 million. Except for a short time after WWI, no Turkish government has ever acknowledged that a systematic slaughter of Armenians occurred.

Three generations later, the events of the massacre still had violent repercussions; beginning in 1973 and continuing over two decades, dozens of Turkish diplomats and nationals were murdered, allegedly by Armenian terrorists.

The survivors of the 1915 massacre were forced into an exodus that carried them to the distant corners of the globe, where they and their descendants proved to be a wandering tribe of high achievers. Diaspora Armenians were the developers of magnetic resonance imaging (MRI), plastic surgery, and the single-handled

water faucet. In a terrible irony, an ethnic Armenian even designed the Soviet MiG warplanes that were used by Azerbaijan to bomb Armenians living in Nagorno-Karabakh.

Three anchors moor the diasporans to their ancestral land, endowing them with Tabibian's place consciousness: the drama of survival, to be sure, the sheer militant defiance of 15-year-olds assembling Kalashnikovs. But also Armenian faith, and that Armenian philosopher who stands beside the Armenian warrior, teaching science and literature in a bomb shelter.

A set of imposing steel doors fills nearly an entire wall on the second floor of the Pontifical Residence at Etchmiadzin, the Mother See of the Armenian Apostolic Church, 12 miles west of Yerevan. A single set of keys exists to open them; it is in the sole possession of His Holiness Karekin II, Supreme Patriarch and Catholicos

**Not Forgotten** *The flame of memory burns bright at Yerevan's Genocide Memorial, built to honor as many as 1.5 million Armenians massacred by Ottoman forces in 1915. Still painful to Armenians: Today's Turkish government rejects the word genocide, coined in 1944, to describe the killings.*





of All Armenians. Beyond the doors is a large onyx tablet, on which the 36 original letters of the Armenian alphabet are written in 20-carat gold. "Those letters are the 36 warriors who always lead us to victory," the catholicos told me.

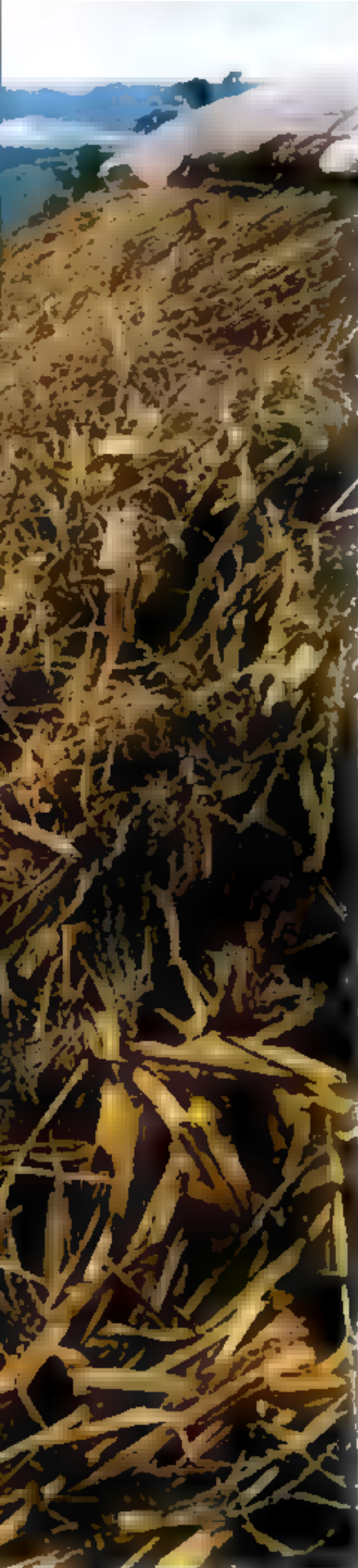
Karekin II is a 53-year-old man with degrees in theology from three European institutions and a boundless store of energy. Since October 1999 he has been the 132nd successor of St. Gregory the Illuminator, who baptized King Tiridates III in A.D. 301 and made Armenia the world's first officially Christian state. Under portraits of his predecessors in a book-lined office, the catholicos spoke of efforts to attract more young people to religious vocations and of his hopes for the reunification of the Western and Eastern branches of Christianity. Pope John

Paul II was among 37 church leaders from around the world who were his guests in 2001, during the 1,700th anniversary of Christianity as the state religion. "We have a warm, brotherly relationship," he said. Then the conversation returned to the tablet locked up on the second floor, with its golden Armenian alphabet.

"St. Mesrob gave us the ability to speak to God with his letters," the catholicos said. "It is through that conversation that we have maintained our identity as a people, and have survived as a nation."

Mesrob Mashtots was a courtier and military figure who became an itinerant priest, a congenial wanderer driven by an obsession with ideas. In short, a classic Armenian. Born sometime around A.D. 360, he is revered as a national

**We visited a classroom where  
15-year-olds demonstrated their speed  
reassembling Kalashnikov assault rifles.**



**Dangerous Ground** *In 1994 Armenians and Azeris signed a cease-fire in Nagorno-Karabakh, but ordnance still litters the region. A flash of light is all 15-year-old Arsen Aroushanian (left) remembers of the explosion that took his leg. Young soldiers (above) still guard the front with Azerbaijan.*

saint, not as a soldier but as an educator. Mashtots gave Armenians their alphabet.

His birthplace was in a small village west of Ararat near Lake Van in present-day Turkey. From childhood, Mashtots was fascinated with language, becoming so proficient in Greek that he quickly rose to a powerful government advisory post. But court life didn't suit him. At the age of 35 he set off into the wilderness, traveling by foot across Asia Minor. A decade into his wanderings, the story has it, the hand of God appeared before him, burning 36 letters of fire into the wall of a cave.

For 35 more years until his death in 440, Mashtots recruited teams of monks to translate the religious, scientific, and literary masterpieces of the ancient world into this new alphabet. Much of their work was conducted in the monastery at Amaras, amid the endless succession of calamities that defined Armenia 15 centuries ago and defines it still, a dozen years after the collapse of the Soviet Union.

**S**vetlana Gasparian is walking home, over a trash-littered wasteland that was a leafy park before the Soviet collapse, when I ask if she has a few minutes to talk. I want to know how people

live in today's Yerevan, I explain. Svetlana hesitates, then she nods her head and beckons me to follow.

She is 37, a widow since 1996 with two daughters and a son, all under 12. Their home is a rented room 15 feet long by 10 feet wide in the bowels of a gargantuan housing complex on the capital's periphery—seven clusters of high-rise apartment towers built in the 1970s to accommodate 60,000 residents. On the corridor where the Gasparians live, 30 families are packed into 30 rooms, served by a single working toilet. With tattered blankets hung from a rope line, Svetlana has divided their 150 square feet into a kitchen cubicle and two tiny rooms, with three narrow beds arranged along the walls and a table wedged into a corner. The kitchen sink is also the family bath. "Life could be difficult in Soviet times," she says. "But never like this."

The apartment has no heat in a city where winter temperatures can dip to 10°F. The rent is 5,000 Armenian drams a month, approximately nine U.S. dollars. "We're about to be evicted," she says, "because we can't come up with that much. I have no idea what we'll do." Her monthly welfare check, as an unemployed nurse and single mother of three, is 8,000 drams.

In a world where living standards for most



*Arthur Karapetian brews coffee outside his home—a prefab shelter next to a construction site—before his daughter goes to school. His city, Gyumri, is still crippled from the 1988 earthquake that left 500,000 homeless.*

*When the earthquake's pall of dust began to clear, more than 25,000 people were dead.*



former citizens of the defunct Soviet Union have sunk precipitously, nowhere has the decline been more agonizing than in Armenia.

When dawn broke on December 7, 1988, Armenia's scientific institutes were among the most advanced in the entire Soviet bloc. Its farms, vineyards, and factories produced some of the highest quality foods and consumer goods available to a closed market of 286 million people that extended from the Russian Pacific to the Black Sea and the Baltic. Armenia was the California of Soviet high technology, the Italy of Soviet shoe manufacturing, the France of Soviet-made cognac.

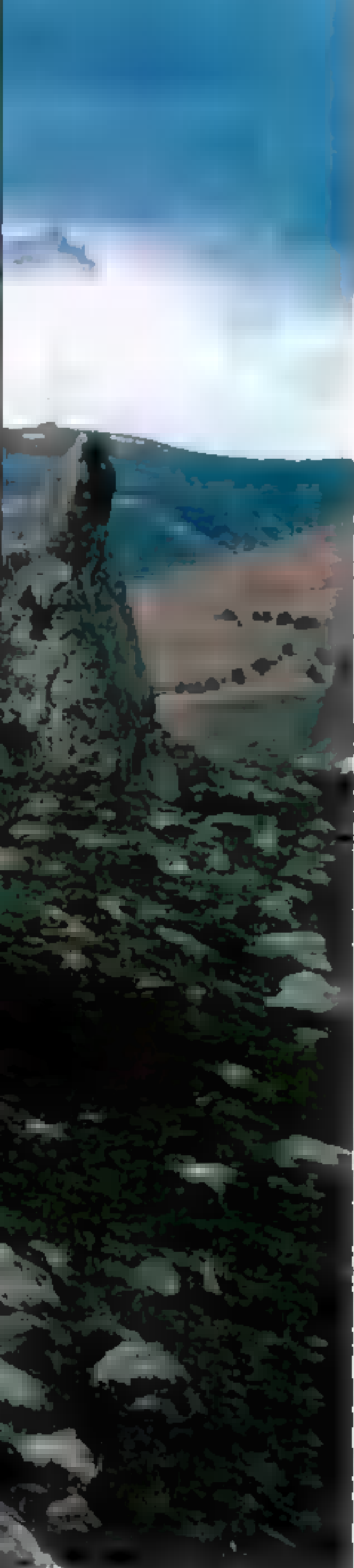
Within three years Armenia was to be the scene of unremitting devastation. As in so many other moments in the immense stretch of Armenian history, the turnabout had a biblical resonance, as though it were the act of an angry Old Testament God. At 11:41 a.m. that December morning in 1988, an earthquake measuring 6.9 on the Richter scale leveled the industrial cities of northern Armenia. When the quake's

pall of dust began to clear a few days later, more than 25,000 people were dead.

It was also in 1988 that the first skirmishes erupted in Nagorno-Karabakh between the region's ethnic Armenians and the police and military forces of Soviet Azerbaijan. Then, in 1991, the Soviet Union tumbled into political dissolution, and on September 21 Armenians voted to become an independent state. What few observers foresaw is that its transcontinental Soviet market would also evaporate with numbing abruptness—or that the Nagorno-Karabakh conflict would lead to a strangling blockade on Armenia imposed by Azerbaijan and Turkey, its two principal doors to the outside world, a blockade that has not yet been lifted.

By 1994 the former Soviet Union's France, Italy, and California had declined into an impoverished backwater swarming with organized crime gangs and haunted with shuttered factories.

"The power stations shut down," engineer Vahe Aghabegians remembers. "High-rise apartment buildings were totally dark at night.



**Rocks of Ages** Mysterious basalt pinnacles (left) placed at Zorats Karer during the Bronze Age point to Armenia's pre-Christian past. Pagan rituals persist at some churches, including Geghard Monastery, where parishioners not only come to pray (above) but to hang strips of cloth on a wishing tree.

Gasoline was a memory. There were no cars on the streets. The only source of heat came from wood fires. In mid-January trees began to disappear from the parks and boulevards.”

In desperation the Armenian government reactivated a temperamental Soviet nuclear reactor in 1994. An agreement was worked out with Iran for oil deliveries and shipments of critical supplies. But when the electricity came back on, people like Svetlana Gasparian could no longer pay for it.

Many Yerevan apartments remained dark for another reason. Armenia's National Statistical Service reported in March 2002 that the republic's population had plummeted by 800,000 since the last Soviet census in 1989. The service's director conceded that there were imperfections in the count, and that the actual loss was closer to one million. Roughly a quarter of the nation had joined the Armenian diaspora.

Vahe Aghabegians is determined to reverse the flow. Born in Iran, educated in Massachusetts, he built a prosperous life in the U.S. as a computer expert in the booming 1980s. For reasons even he can't pin down—“Armenian reasons,” he says, leaving it at that—he began paying regular visits to Yerevan in 1992.

In 1998, when he turned 45, he convinced his wife, Odette, who is also Iran born and American educated, to move with their two sons to Armenia, where he now serves as an unpaid high-technology adviser to the government. Odette is the proprietor of a Yerevan travel agency. They were drawn here, as it were, by the ancient gravitational pull of Ararat, by an unfulfilled yearning.

Vahe's dream is to shepherd Armenia into the 21st-century industrial world, an ambition he shares with Foreign Minister Oskanian, who has provided office space for the dream. The idea is to build on the Singaporean model, to emulate the development of another small nation with few resources into a pivotal regional power in information technology.

**History for Armenians has never been a detached experience, lost in the currents of change. It is an unbroken cultural memory.**

# Armenians have been pondering Mount Ararat and its neighbor, Little Ararat, since the birth of civilization.

"The wherewithal is here, the belief in education, the intellectual capacity," Vahe says. As he speaks, half a dozen young people sit transfixed before computer screens. "Too late," his local critics say. The number of researchers employed in Armenia's once respected scientific institutes dropped from 20,000 in 1990 to 5,000 in 1995, they note.

"A few years ago, I too felt that Armenia had no future," countered Anna Simonian, a 25-year-old media consultant, when I sought the opinion of someone from the IT generation. A graduate of the American University of Armenia, which was created in 1991 as the nation's first institution to provide further education in business administration, Simonian is convinced there are new prospects. "A lot of computer programmers who had been working as bartenders are slowly returning to programming again," she says.

Between 1998 and 2000, the UN estimates, annual technology-related exports from Armenia rose by 25 percent to \$250 million. Vahe Aghabegians reads the UN reports closely. A Singaporean Yerevan is his Ararat.

One morning, lost in my own philosophical reflections as I walked through central Yerevan, I heard the murmur of a cello chorus rising from the ghostly hulk of a concrete music hall that had opened in the 1970s and was all but abandoned after the Soviet implosion. Inside, the main stage and seating area were unlit and empty and ripe with the odor of advancing mold. The cellos had been joined by violins, and, turning a corner, I finally saw them in a small glass-enclosed room perched on the building's crumbling rear terrace, two dozen young musicians furiously sweeping their bows under the baton of Aram Gharabekian, artistic director and principal conductor of the National Chamber Orchestra of Armenia.

In 1997, he told me later, "we started with nothing. There weren't even enough chairs for my musicians. We held administrative meetings sitting on benches in the main city square.

My secretary had no paper to take notes."

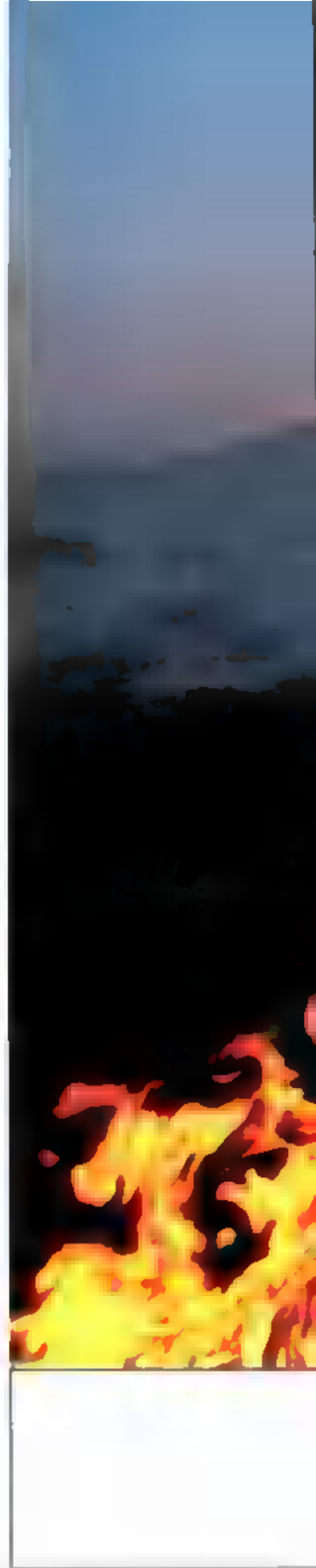
By 1998 the orchestra had recorded its own compact disc. By 2003 it had performed on three continents. Gharabekian's explanation? "We couldn't settle for competence, for just being good. We worked, always, toward the very highest international level. That was the only way doors would open for us."

Eventually 93 interviews filled the notebooks that recorded my Armenian journey. I found that almost all of them mirrored the orchestra's tale, the tale of Noah, the epic of survival—with that long view toward something more than merely surviving, toward a shimmering summit just beyond the limits of despair.

**F**or the first five years after the city of Leninakan was shattered in the 1988 earthquake, Hakob Barseghian waited patiently, even longingly, for death. "My wife was gone. My son was gone. What was there to live for?"

But in its arbitrary, inscrutable way, death refused to claim him. On a spring morning in 1993 Barseghian took a deep breath and stepped outside the 25-foot-long aluminum shipping container that had been his home through the long black night of grief—the insistent grief that has marked so many dark episodes in Armenian history and set the scene just as insistently for improbable tales of renewal.

He began scouring the rubble of Leninakan, which had reassumed its pre-Soviet name, Gyumri, for usable parts. Nuts and bolts, steel cylinders and canisters, valves carefully pried from a wrecked automobile. He carried them







**Seared Image** *Farmers burn their fields, then sow their seeds. Seasons change. Centuries pass. Yet Ararat still beckons. Why? Garbis Muradian, a diasporan who has seen it only in photos, shrugs. "It's something here," he points to his head. "And here," he taps his heart.*

back to his metal container in the ruins. Then he set about reinventing civilization. Not the kind of civilization defined by architectural monuments or orchestras. That would come later, Barseghian was certain; it always had for Armenians. Trained as an industrial engineer for industries that no longer existed, he began with the basics, with elemental machines suited to the elemental needs of a shattered city. He designed and built a meat grinder, a food blender, a pedal-driven sausage stuffer, equipment for smoking and curing, coarse and fine slicers.

In a dog-eared botany textbook, Barseghian learned that the mountain pastures of northern Armenia boast one of the Earth's most extensive varieties of wild herbs. He started collecting them, and he invented machines to dry and cut garlic and horseradish, cumin and basil, chamomile and tarragon, rose hips and thyme.

Then he invented machines to package and seal medicinal teas.

When I visited him, three food-processing plants were humming along the walls of the expanded aluminum container, each machine's function and design explained in meticulously drafted blueprints. "Forgive us our faults, dear Lord," Hakob Barseghian prayed over a lunch of cured meats and chamomile tea prepared for his guests. "Lead us into the heavenly kingdom and bring your mercy to those who need it."

Apart from his five years of paralyzing sorrow, when even a prayer was beyond him, he says, "I have always been an optimist. I have always been a believer." □

**WEBSITE EXCLUSIVE** Print a map of Armenia, visit our photo gallery, and get tech tips from photographer Alexandra Avakian at [nationalgeographic.com/magazine/0403](http://nationalgeographic.com/magazine/0403).



# Harp Seals

THE HUNT

BY KENNEDY WARNE

PHOTOGRAPHS BY BRIAN SKERRY

I am floating in an undersea world of billowing ice clouds and shadowy canyons—the winter kingdom of Canada's Gulf of St. Lawrence. Shafts of sunlight lance the surface waters only to be quenched by the gray depths. Translucent comb jellies drift past, slaves to the current.

Harp seals appear, ghostly torpedoes on the edge of visibility. Their hind flippers splay and fold like fans, propelling them with graceful, powerful strokes. A few come close, inspecting me with dark bulging eyes. One twists upside down, revealing the harp-shaped blotch on its back that gives these seals their name. I break the surface in a gap between floes. Female harp seals bob in

F O R   B A L A N C E





**MOTHER KNOWS** One sniff confirms the maternal bond between a mother harp seal and her fluffy pup. Images of unweaned pups being clubbed to death, first televised in the 1960s, led to a 1987 ban on killing baby seals, called white-coats. But Canada's annual hunt for older seals continues under a quota system that critics argue is too generous, even with today's plentiful seal population.



the margarita slush, peering over the lip of the ice to check on their pups. The rhythmic rise and fall of their heads looks like pistons coupled to an invisible crankshaft.

It's mid-March, high season for harp seals. They have migrated 2,000 miles south from the Arctic to reach their traditional spring quarters in the Gulf of St. Lawrence and off the coasts of Labrador and Newfoundland. All the big events of their lives—mating, giving birth, molting—happen here, where blizzards rake the frozen sea and currents crumple the floes into an icy Stonehenge.

I have come to the gulf to witness this southern sojourn of *Pagophilus groenlandicus*, the “ice-lover from Greenland.” But there's another reason for being here. Forty years ago a bitter controversy broke out between Canadian sealers and animal-welfare groups over the hunting of baby harp seals. The harp seal pup, with its fluffy white coat and black pleading eyes, became the darling of the antisealing movement and a symbol of all that was wrong with human exploitation of nature.

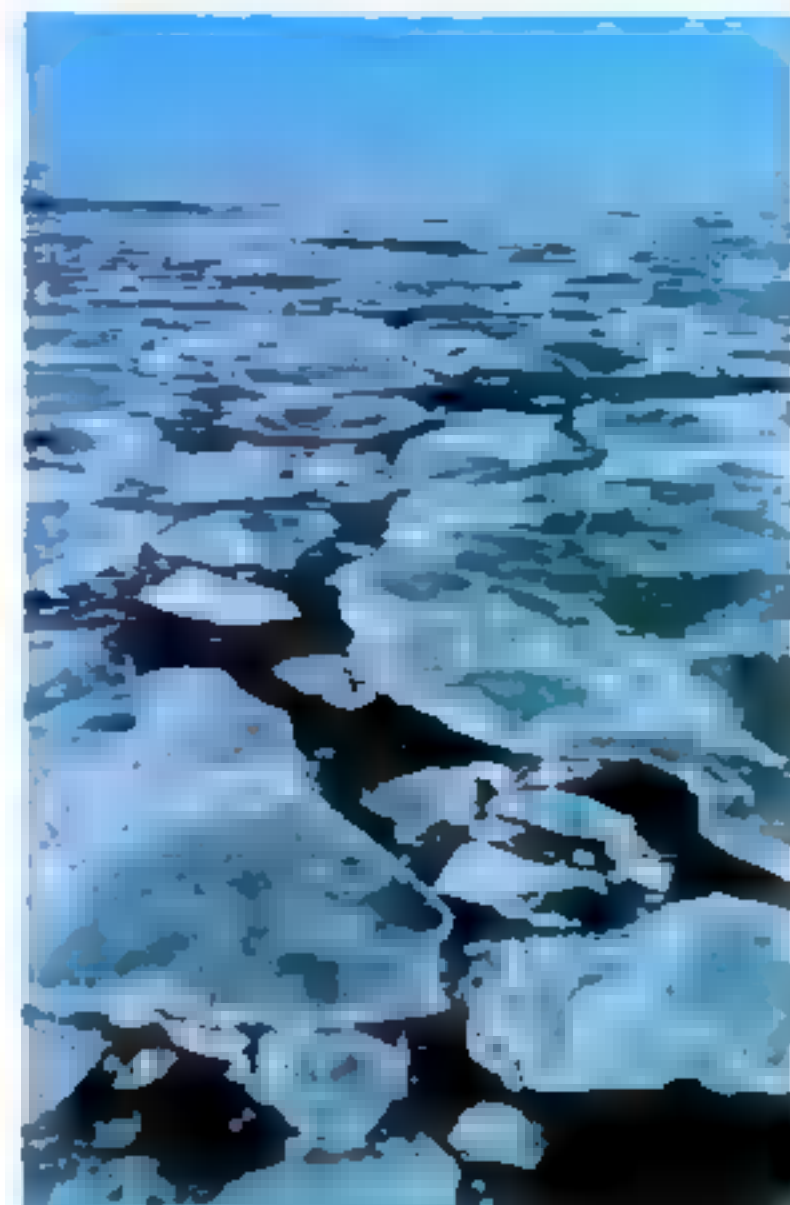
After nearly two decades of fervent protest, the European Economic Community bowed to pressure from environmentalists and in 1983 banned the importation of whitecoat pelts and all harp seal products, a mandate that crippled the seal trade. For many the battle ended there: a victory for nature. But fur is back in fashion, and although the whitecoat pup is protected under Canadian law, the hunt for older pups is booming. In fact, more harp seals are taken today than at any other time in the past 35 years. The North Atlantic seal hunt has become the largest marine mammal hunt in the world.

Given this renewed pressure, how is the species faring today? Have protest and legislation secured the harp seal's future? Or is *Pagophilus* destined to go the way of the great whales, its surviving populations only pathetic remnants of a once prolific species?

**T** rue to the old adage, March 2003 comes in like a lion. Ontario residents shovel seven-foot snowdrifts to get out their front doors. Three of the Great Lakes freeze over, delaying the start of the shipping season. The Magdalen Islands, a fishhook-shaped archipelago in the middle of the Gulf of St. Lawrence, is clenched in a fist of ice and shivers in below-zero temperatures.

From the air, during the 30-mile helicopter flight from the Magdalens to the harp seal breeding grounds, the gulf looks like the mother of all wedding cakes, the work of battalions of bakers who have heaped on swirling mountains of white frosting. My eyes strain to pick out the whelping patches: clusters of mothers and pups basking beside leads of open water. Frozen afterbirth and smudges of red on the ice show where pups have been born.

Sea ice is critical to harp seals for giving birth and nursing pups and, several weeks later, for molting. The ice has to be thick and stable enough to support the seals, but if it's too thick they can't keep their breathing holes open. If the ice lingers into spring,



## IRREGULARITY

Ice presents a make-or-break dilemma for harp seals: Too solid and it can limit access to sea life and airholes (left); too thin (above), and it won't provide stable whelping sites. The seals' dependence on ice is reflected in their range (below), which corresponds to the seasonal limits of pack ice. Each fall herds in the northwest Atlantic migrate south to whelping grounds off Labrador and Newfoundland and in the Gulf of St. Lawrence. Two smaller populations use whelping sites off Jan Mayen island and in Russia's White Sea.









**ALL WET** Thin ice gives way and a pup about seven days old takes a plunge. At this age the pup doesn't have enough insulating fat to survive in the frigid water. The alarmed mother nudges it back toward the ice, but can do little else. "It was going under and struggling," says photographer Brian Skerry, "but the mother kept pushing." After several tense minutes, the baby hoisted itself to safety.

it can become jammed against the coast. Pups unable to reach open water to feed can be crushed between the grinding slabs.

Too little ice is also a problem. Some years the floes break up early, plunging young pups into the sea before they have enough blubber to withstand the cold water. An extremely light ice year can result in catastrophic mortality, and some scientists have warned that global warming could increase the frequency of light ice years. Six of the last nine winters were unusually mild, and if the trend continues the seals will suffer the consequences.

There is no lack of ice in 2003. Jumbled floes jut from a vast, wind-sculpted ice prairie. The yowling, mewling, gargling, and wailing of harp seal pups fills the air. Some scuffle across the ice, pushing up little bow waves of snow with their snouts. Others nestle in ice cradles formed by their own body heat. Many are spectacularly fat. They lie on

**Environmental crusaders—alarmed by the seal's declining numbers and outraged that hunters were targeting pups not yet weaned off their mother's milk—vowed to stop the slaughter of the innocents.**

the ice like portly powder puffs, their heads pulled back into their shoulders, fur fluffed up, eyes half closed and moist with tears; lacking the tiny ducts that remove excess tears, their eyes weep constantly. After a couple of weeks their silky white fetal hair—the lanugo—starts falling out, revealing a dappled gray coat beneath.

Stacking on fat is vital for these young pups. Although they can swim almost from birth, they need the thermal insulation of a thick blubber layer to survive in frigid seas. So during the first days of their lives, pups gorge themselves on one of the richest milks in all of nature, putting on as many as five pounds a day. At weaning—around ten to twelve days old—they weigh more than 70 pounds.

To the European settlers of the region, harp seals must have looked like barrels of lard, abundant and free for the taking. And take them they did. By the 1850s more than half a million harp seals—most of them whitecoat pups—were being killed during the annual hunting season. Oil, not fur, was the primary product. The seal oil of Newfoundland lubricated the sewing machines of England.

The fur itself didn't become popular until the late 1940s. Before then there was no technology to keep the luxuriant white lanugo from falling out of the dressed skin, so seal pelts were tanned into leather. After 1945, however, Norwegian advances in fur-dressing meant that the harp seal pelt could be marketed as a fur. Demand for the fashionable fur rose quickly, at a time when harp seal populations were already in decline. By 1972 the Newfoundland–Gulf of St. Lawrence harp seal stock stood at less than two million animals. In 1976, as debate over the hunt was heating up, seal scientist David Lavigne warned in this





## FAT CHANCE

On snow splashed with seal urine near the Magdalen Islands, researcher Mike Hammill nets a mother to check her weight. Average harp seal weight has dropped over three decades, but the slight decline has had no ill effect. A nursing pup (left) can gain about a pound every five hours, while the mother loses the same about every three. It's no wonder: She's a factory, producing milk with fat content of 50 percent or higher. (Cow's milk is 4 percent fat.) Within two weeks nursing results in a chubby warm pup called a fat white-coat (following pages).

magazine that “the survival of the harp seal hangs in the balance.”

His warning would become a call to arms. Two centuries after Moravian missionaries in Labrador chose the harp seal pup to explain the Lamb of God to the Inuit, who had never seen a sheep, environmental crusaders—alarmed by the seal's declining numbers and outraged that hunters were targeting pups not yet weaned from their mother's milk—vowed to stop the slaughter of the innocents.

**C**ar license plates in Quebec—which includes the Magdalen Islands, or Îles de la Madeleine—bear the legend, *Je me souviens*, meaning “I remember.” The Madelinots, as the 95 percent of islanders who are French-speaking call themselves, do not easily let go of their 250 years of history and traditions. They remember the dark days following 1755 when, fleeing deportation by the British, the islands' founding families made their way from what is now Nova Scotia to start a new life. Though farming folk, these exiled Acadians were forced to turn to the sea for sustenance. Today the fishing industry makes up 80 percent of the islands' economy. A thousand of the 13,000 islanders fish for a living, and a similar number process the catches of lobster, crab, herring, and mackerel.

Madelinot fishermen also remember the two decades of tribulation that began in the 1960s when antihunt campaigners, spearheaded by the International Fund for Animal Welfare and later by Greenpeace, triggered the eventual collapse of the seal trade. Portrayed as murderers and barbarians, fishermen suffered the contempt of the masses as television brought graphic scenes from the ice fields of the North Atlantic into the living rooms of Europe and North America.

Taking part in what had been known as the greatest hunt in the world—an enterprise that in the 19th century had involved more than 13,000 men and 400 sailing ships—was no longer a matter of pride but







a mark of shame. Once hailed as “Vikings of the ice,” the sealers were now the scum of the earth. The Madelinots’ cries of *Nous ne sommes pas des bouchers!*—We are not butchers!—sounded hollow when accompanied by photographs of upraised clubs and bloodstained ice.

Jocelyn Thériault was a youngster when the protests peaked. Now 34, he owns a one-third share in a 65-foot fishing boat, *Manon Yvon*. He, his brother, and a cousin fish for snow crab and redfish. They used to fish for cod, too, but in April 2003 the North Atlantic cod fishery, which had failed to recover despite closures and dramatically reduced harvests, was shut down indefinitely by the Canadian government.

The demise of the cod industry has given renewed purpose to modern-day harp seal hunters: The livelihood of fishermen like Thériault depends on harvesting whatever the sea has to offer—including seals. Since 1987, when Canada outlawed commercial hunting for whitecoat pups, the main focus of the hunt has been molted pups known as beaters—so named because they tend to thrash the water when they swim, not because the traditional method of killing them is with clubs. Today beater pelts can be worth 40 Canadian dollars or more to a hunter.

I meet Thériault at the wharf in Cap-aux-Meules, the commercial center of the islands. He and his crew are loading supplies for the seal hunt, set to begin in a couple of days, ice permitting. Like all fishermen

## TEST DIVE

**A whitecoat displays its swimming skills below the ice as a nearby adult looks on. Harp seals routinely go five minutes without surfacing, and can stay down for more than 15 minutes. Feeding on fish and invertebrates, they may dive deeper than 900 feet.**

in this region, he can fish only eight months of the year because the coast is icebound through the winter. When he can't fish, he collects unemployment. With a 1.5-million-dollar boat to pay off, four months is a long time without significant income—and a long time to be ashore if your life is the sea.

Thériault has been seal hunting for eight years. In a good year—navigable ice, accessible seals, firm prices for pelts and oil—he and his crew of 12 can jointly earn \$150,000 during the spring hunt. As with most fishermen here, Thériault derives only about 5 percent of his earnings from harp seals. It doesn't sound worth the effort until you consider the other reason fishermen hunt seals: They argue that the animals compete for the very thing that puts croissants on the family table. In French, the harp seal is *loup-marin de glace*, sea wolf of the ice. As one Madelinot told me, "They don't eat turnips, that's for sure."

Biologists estimate that each year an adult harp seal devours more than a ton of fish—mostly capelin, sand lance, and arctic cod—and invertebrates such as crabs, shrimp, and krill. Harp seals are thought to account for more than 80 percent of the estimated four million tons of fish and zooplankton consumed by all seal species in the northwest Atlantic. In the fisherman's arithmetic, that equates to a lot of seafood not going into his nets. Cull the harp seal population, say fishermen, and you level the playing field.

Critics scoff at this logic. Given the myriad interactions between marine organisms, it is folly to suppose that culling one species will increase the population of another. Opponents accuse fishermen of wanting to play God with the resources of the sea. While the history of overexploited fisheries more than backs up this view, fishermen say they have learned from past mistakes. "I am a new generation of fisher," Thériault insists. "I don't want to kill all the seals, just make a fair play."

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**W**hat constitutes fair play is ultimately a political decision. Out on the ice floes I join Mike Hammill, a seal biologist whose work helps the Canadian government manage its marine resources. "You picked a nice day for it," says Hammill, his frost-reddened face breaking into a grin. The temperature is 32°F, and the wind stings like peroxide.

Dotted about the ice, sleepy-eyed newborns nurse in utter contentment from mothers lying in Rubenesque repose. Along with whitecoat pups (which the Madelinots call *blanchons*, white ones) there are several "ragged jackets"—pups between 15 and 30 days old that are losing their baby fur on their way to becoming beaters. Some are nearing the end of the molt, the last of their white coats flaking off in swatches from the sleek gray fur beneath. Pups at this stage have been recently abandoned by their mothers and must fend for themselves. For now, they have little to fear from predators: Orcas, polar bears, and Greenland sharks take harp seals in the Arctic but don't follow them to their breeding grounds in the gulf.

Hammill, a senior scientist with Canada's Department of Fisheries and Oceans (DFO), has been studying harp seals for more than 15 years. He and his colleague Garry Stenson have been working to produce a model of the harp seal population, based on such factors as how many seals are born each year, how many die, and how many are in each age group. The model assists the government in setting one supremely important number: the TAC, or total allowable catch. In the government's eyes, a fair TAC is one that maximizes the sealers' returns

The demise of the cod industry has given renewed purpose to those whose livelihoods depend on harvesting whatever the sea has to offer.

without compromising the harp seal stock. Invariably, sealers consider it to be too low and conservationists too high.

I watch Hammill as he creeps toward a resting female, carrying two aluminum poles with a piece of fishing net stretched between. Suddenly he breaks into a run, throws the net, then dives onto the startled animal. An assistant helps him flip the seal over (no easy matter, as adult females weigh around 280 pounds) and tie the ends of the poles together. Once pinned, the seal becomes as placid as her pup, which is watching from a few feet away. Using a block and tackle mounted on a tripod, Hammill weighs both mother and pup, then measures and tags them. After anesthetizing the mother, he extracts a tooth. Counting the layers of dentine is the most efficient way to determine the seal's age.

This work is part of an annual live-capture program designed to help fine tune the population model. By sampling a range of females of varying ages, Hammill and his colleagues hope to formulate a relationship between population density and reproductive rate, and also to find out what impact bad ice years have on the long-term fortunes of the seal herd.

Hammill says the DFO's management objective for harp seals is a long-term sustainable harvest. The idea is to use the TAC—broken down into quotas for each sealing area—to control the population. At the moment the department considers harp seals to be abundant, so it has set a relatively generous TAC—975,000 for the three years from 2003 to 2005. Hunters can take up to 350,000 seals during any two of those years, but the total for the three years cannot exceed 975,000.

If the quota is filled, it will drive the population down, Hammill says, but not too far down. To guard against overexploitation, the DFO has established benchmarks at 70 percent, 50 percent, and 30 percent of 5.5 million, the highest estimate of the population in recent times.

"The government is committed to keeping the population above the 70 percent benchmark of 3.85 million," Hammill says. "If it dips below that number, conservation measures such as lowering the TAC will follow. If the population hits the critical warning point—the 30 percent benchmark, or 1.65 million—we will shut the hunt down."

Right now the harp seal is the second most abundant seal in the world, behind the crabeater seal of Antarctica. The number of harp seals in the northwest Atlantic, currently estimated at 5.2 million, is three times higher than in the early 1970s. The most recent pup census,



## THE COLD

In the chill of early spring, harp seals about two weeks old become fair game as they wean and begin shedding their downy fur. After another few weeks as molting "ragged jackets," the young seals, now called beaters for how they







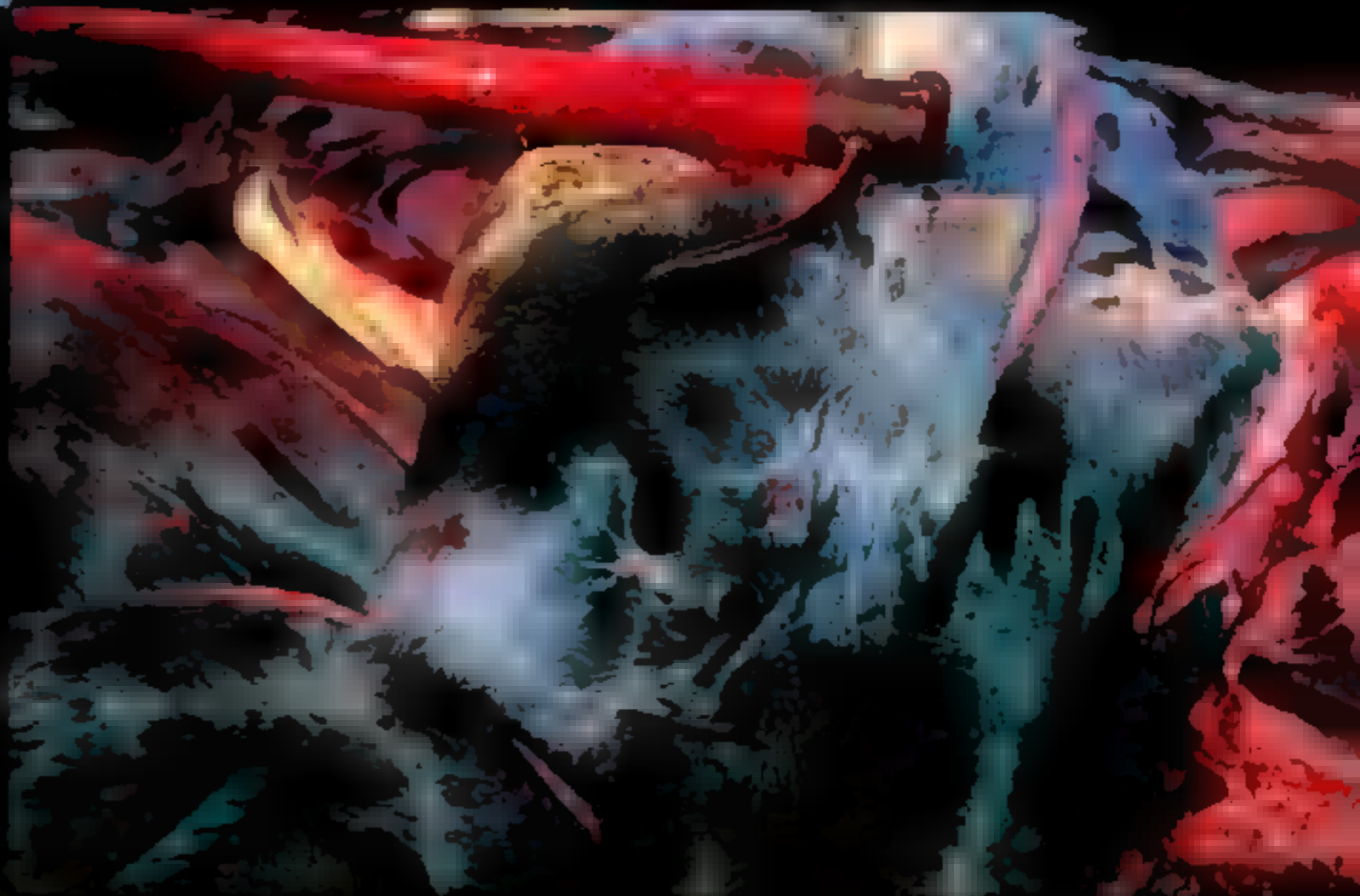
On deck, Ghislain Cyr (below), a fisherman most of the year, dunks seal hides in the water to rinse and chill them. Each may fetch 40 or more Canadian dollars.

"I've been doing this all my life," says Cyr. "My father was a fisherman and seal hunter too. My son, though, is better with computers. I doubt he'll hunt seals."

## FACTS OF THE HUNT

beat their flippers on the water, sport a sleek, unmarred pelt—and so become the prime quarry of sealers. In Canada last year hunters landed some 286,000 harp seals, most of which were less than four months old. Hunters cross the shifting ice

armed with hakapiks (right). A firm blow to the head—a method approved by the Canadian government—can kill a seal quickly. Hakapiks double as a tool to haul skins to a boat (above), or for a hunter to haul himself to safety if he falls through the ice.



conducted in 1999, counted almost a million pups born that year.

It is too early to tell what effect the current quota levels will have, but in theory, given a healthy stock of long-lived adults (harp seals live for 30 years and start breeding between four and eight years old), juveniles can be hunted in relatively high numbers without jeopardizing the population. But opponents of the hunt say the DFO's management approach is based on shaky assumptions and accuse the government of taking unacceptable risks with a vulnerable species. "Remember," warns David Lavigne, author of the 1976 *GEOGRAPHIC* article, "the last time harp seal catches were this high, the population plummeted by more than half over 20 years."

**T**he old adage proves right again: March 2003 goes out like a lamb. Temperatures are rising and the Îles de la Madeleine are thawing. Gobbets of ice fall from the power lines and explode in puffs of white on the tar roads. Diggers scoop ice away from boat-launch ramps and a mobile crane lifts craft that have been on blocks all winter back into the water. I linger over their names:

**A battle still rages between those who view sealing as a legitimate use of a renewable resource and those who believe seals, along with whales and dolphins, should be above exploitation.**

*Pelican, Sushi Provider, David's Last, Dickson's Dream.* Madelinots call this time of year *le reveil du printemps*, the awakening of spring. For fishermen it's a release, a chance to feel salt wind on the face again and the throb of the engine beneath the deck.

At Cap-aux-Meules, *Manon Yvon's* berth is empty. Thériault and his crew are out there somewhere, ramming their way through the floes. But for smaller vessels the ice is too thick this year, and most will remain tied up. One boat, *Frolic*, will risk the sea and never return. Her crew will be rescued, but she will go down, another corpse for the "graveyard of the gulf."

Within two months, however, the gulf ice will have disappeared, flushed into the Atlantic. The harp seals will have gone too, their automatic pilots set to north for the journey back to the Arctic. The coming and going of ice, seals, and sealers has been happening for a long time in this part of the world. In the Magdalen Museum of the Sea, I come across a copper penny, struck during the early 1800s and used briefly as currency in the islands. One side depicts a seal, the other a cod—two commercial staples of Magdalen life. The coin carries the motto, "Success to the fishery"—a slogan that has become a mockery with the collapse of the commercial cod fishery.

Conversely the seal hunt has endured. Today's catches are approaching levels of those a century ago—between 200,000 and 300,000 a year, excluding the hundred thousand or so taken annually by sealers in Greenland. In 2002 the value of harp seal products landed in Canada exceeded 22 million Canadian dollars, the highest in recent memory. Most of the money is in the pelts, though there is still a multimillion-dollar market for harp seal oil. No longer used for sewing machines, the oil, now prized for its high content of omega-3 fatty acids, is



## CHILLING OUT

Oblivious to the heated controversy surrounding it, a whitecoat rests on the ice. Today harp seals in the northwest Atlantic number an estimated 5.2 million, three times the total in 1972, and officials say the future of the species is secure. Others are less optimistic, but hope that the harp seal will keep beating the odds.

processed into capsules and sold as a health supplement. Researchers have also developed a hand cream from the oil and are working on a protein derivative from seal meat.

Success on every front? Not quite, for quotas can't address the most fundamental question: Should seals be killed at all? And so the battle still rages between those who view sealing as a legitimate use of a renewable resource and those who believe seals, along with whales and dolphins, should be above exploitation. For now the Canadian government has opted for sustainable use, a decision that distresses nature lovers but that allows fishermen like Jocelyn Thériault to maintain a way of life they cherish.

Look at a harp seal and what do you see? Lamb of God or wolf of the sea? Nature's sanctity or nature's utility? Perhaps it is possible to see both. On the bridge of the *Manon Yvon*, tacked above the main window, is a small printed prayer with a silver crucifix dangling from it. Thériault's grandmother gave him the note when he launched the boat. The prayer is simple but suggests stewardship, the old-fashioned word for sustainability. "Lord, my vessel is small and your sea is vast," it says. "Help me this day, for the riches of the sea belong to you. *Merci.*" □

**WEBSITE EXCLUSIVE** Sustainable harvest or senseless slaughter? Share your opinion about harp seal hunting when you join our online forum—and hear Brian Skerry describe the joys and challenges of photographing baby seals—at [nationalgeographic.com/magazine/0403](http://nationalgeographic.com/magazine/0403).





# China's growing pains

MORE MONEY,  
MORE STUFF,  
MORE PROBLEMS.  
ANY SOLUTIONS?



## SELLING OUT

Luxury flats fill up as fast as they're built in Chengdu, 900 miles from Beijing. But China's race to riches comes at a high cost to both land and people.



**FLOW OF WEALTH**  
Fifth clogs the Fen River in the northern city of Taiyuan. Unseen pollution—heavy metals and noxious chemicals from factories—also fouls water in China's major rivers.









**UNBEARABLE**  
Li Aihua (opposite) awaits justice for a son dead at 29 of silicosis, a lung disease contracted in a Jiangxi Province gold mine. "I continue to ask the government for reasons for the death of my second son." A Hebei man reveals hands he says were burned by water containing caustic effluent from a zinc-plating factory. He hides his face to avoid reprisal.

**I**n Daqiao, a remote village in Jiangxi Province, the landscape is straight out of a Chinese scroll. Ragged boys perch on sleek black oxen furrowing lush fields, and sage-looking ancients contemplate the smoke from their pipes as they relax beside village ponds, disturbed only by the squabbles of ducks and geese. Outwardly nothing appeared amiss. But as a crowd of children stared and giggled at their first sight of a foreigner, Zhu Longshen sat, his face frozen in grim preoccupation, in the atrium of his 200-year-old stone house. After we made our introductions, he began reading from a petition intended for officials in Beijing: "Dear Leaders, because of our hunger for gold, we suffered a catastrophe."

The words were as much a moral fable for modern China as the preamble to a plea for help. A decade ago when gold was found nearby, local officials decided to blast open a mine, recruiting villagers to work in it. Before long the men were sickening from a mysterious disease. It turned out to be silicosis, which had come from inhaling mine dust loaded with invisible silica flakes.

"We didn't know such an illness even existed before this happened," Zhu said again and again. Zhu, who is 34, has a wife and four children. He looked brown and healthy, but as he talked, his hands trembled, and his lungs, clogged with silica, labored to inhale. He said the disease, which is incurable, had already killed more than 100 of his 400 fellow miners, and he feared that within a year or two it would kill him and the rest of them.

When the mine opened, Zhu had jumped at the chance to earn \$25 a month—much more than he'd ever made before. In this he is typical of a vast new group of Chinese, the roughly 200 million peasants who have left farming in the past 20 years. He is also an example of how in seeking a better life, Chinese, and especially rural Chinese, often take on the world's dirtiest jobs. More than 25 million Chinese workers are now in regular contact with life-threatening toxic dust and poisonous material. Millions more endure physically sapping and mentally dulling work in factories and sweatshops, making toys, shoes, and sporting goods for the United States and other rich consumer nations.

A thousand miles south and west of Daqiao the sleepy village of Naren perches at 11,000 feet in the upper reaches of the Yangtze River in Yunnan Province. Progress hasn't inflicted deathly sickness on the people here, yet they readily admit that their growing prosperity has come with risks.

"The trouble is everybody is trying to build a bigger house than his neighbor," said Gesrong Dinghu. Gesrong—Naren's headman—invited me and several villagers onto his roof for a better look around. Pointing a finger at the large, extravagantly painted wooden house next door, he noted with a hint of envy that it had a new satellite dish.

"It was the mushrooms that made us rich," explained his friend Lurong, still amazed by the unexpected turn in Naren's fortunes. "All these years we never realized we had this gold just growing under our feet."

Naren's gold is the stubby matsutake mushroom, which grows wild amid the roots of oak and pine trees and is a delicacy for which Japanese gourmets pay high prices. The boom began in the 1980s when the first Japanese buyers arrived. Now over the course of a summer, villagers can earn as much as a thousand dollars—five times as much, if they're lucky—by picking mushrooms and medicinal herbs.

Before their windfall, the people of Naren, like other ethnic Tibetans in the region, rated among the poorest of the poor, subsisting on barley and corn grown in fields scattered through the steep valleys and grazing their yaks in the peaks high above. Then, flush with new money from mushrooms, the villagers began

**CHINA'S SHIFT** away from  
old habits and attitudes  
has only just begun.



**BUY THIS!**  
A billboard in Chengdu heralds a shift from a centralized to a consumer economy. The sign—stressing a washing machine's water efficiency—reflects rising environmental concern among the Chinese.





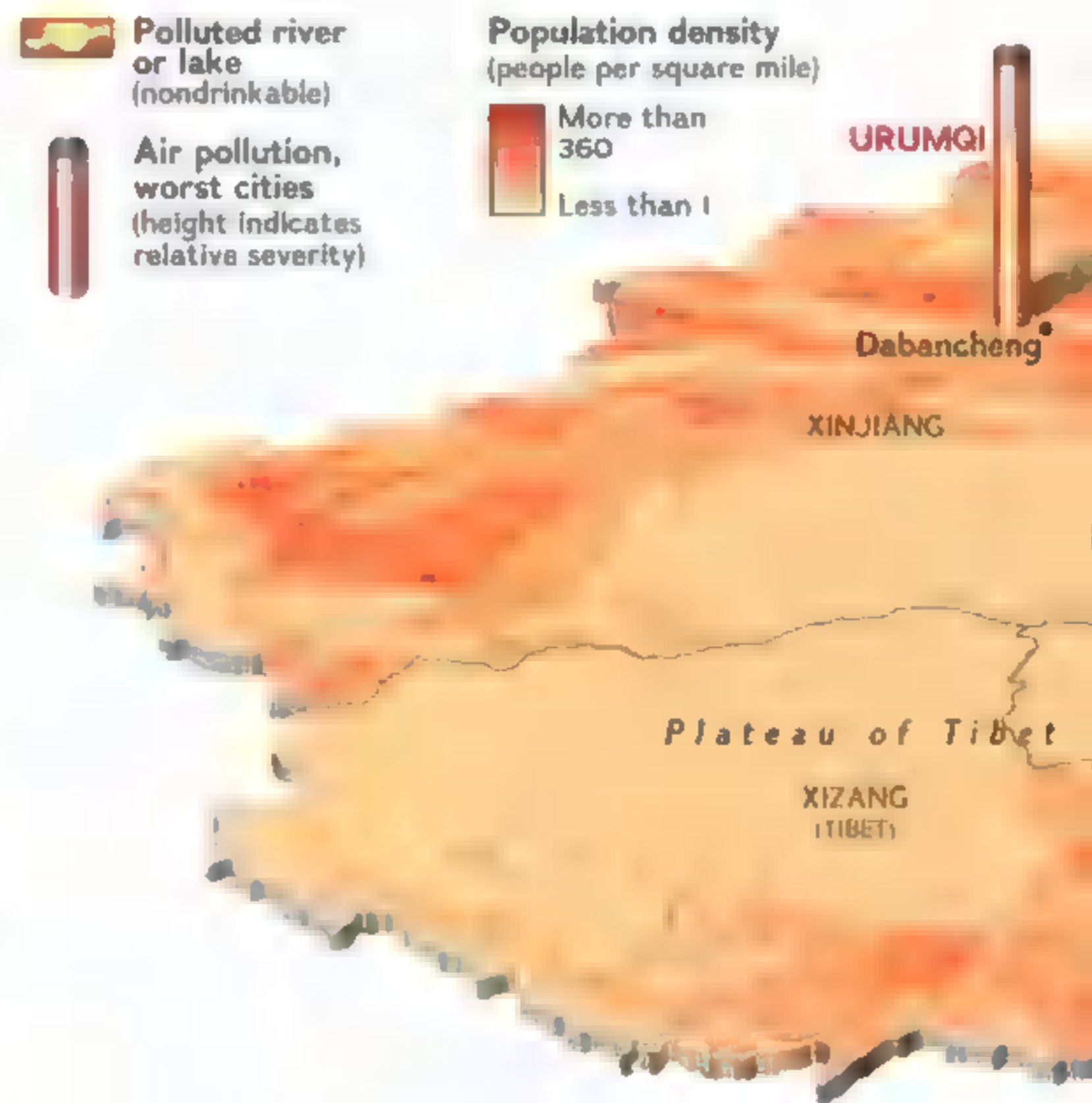
**UNCLEAR VIEW**

Industrial haze hangs near Taiyuan, a coal and steel center with air quality among the worst in the country. One of the world's largest producers of greenhouse gases, China—as a “developing nation”—is exempted by the international Kyoto treaty from cutting its carbon dioxide emissions.

building themselves fine new wooden houses, as big as Swiss chalets, equipping them with TVs, CD players, and other luxuries of modern living. But how long can the good times last?

Lurong's 73-year-old mother remembers how different the area looked when she was growing up. "There were oak trees covering all these hills," she said, lifting an arm toward the bare slopes. The village then had 20 households; now there are 42, and families have been steadily cutting down their trees to build houses and to use for fuel. Shaking her head, she said that Naren has been plagued by flash floods. Indeed, every year in Yunnan Province some 500 people die in floods and landslides that wash away not just houses but entire sections of roads and railroads. Without trees and bushes to soak up rainfall, the water rushes off the bare slopes. Beyond flooding, villagers worry that more tree cutting could put an end to the mushroom bonanza—and their ability to acquire the creature comforts of modern life. "Without the forests we have nothing," said Gesrong Dinghu.

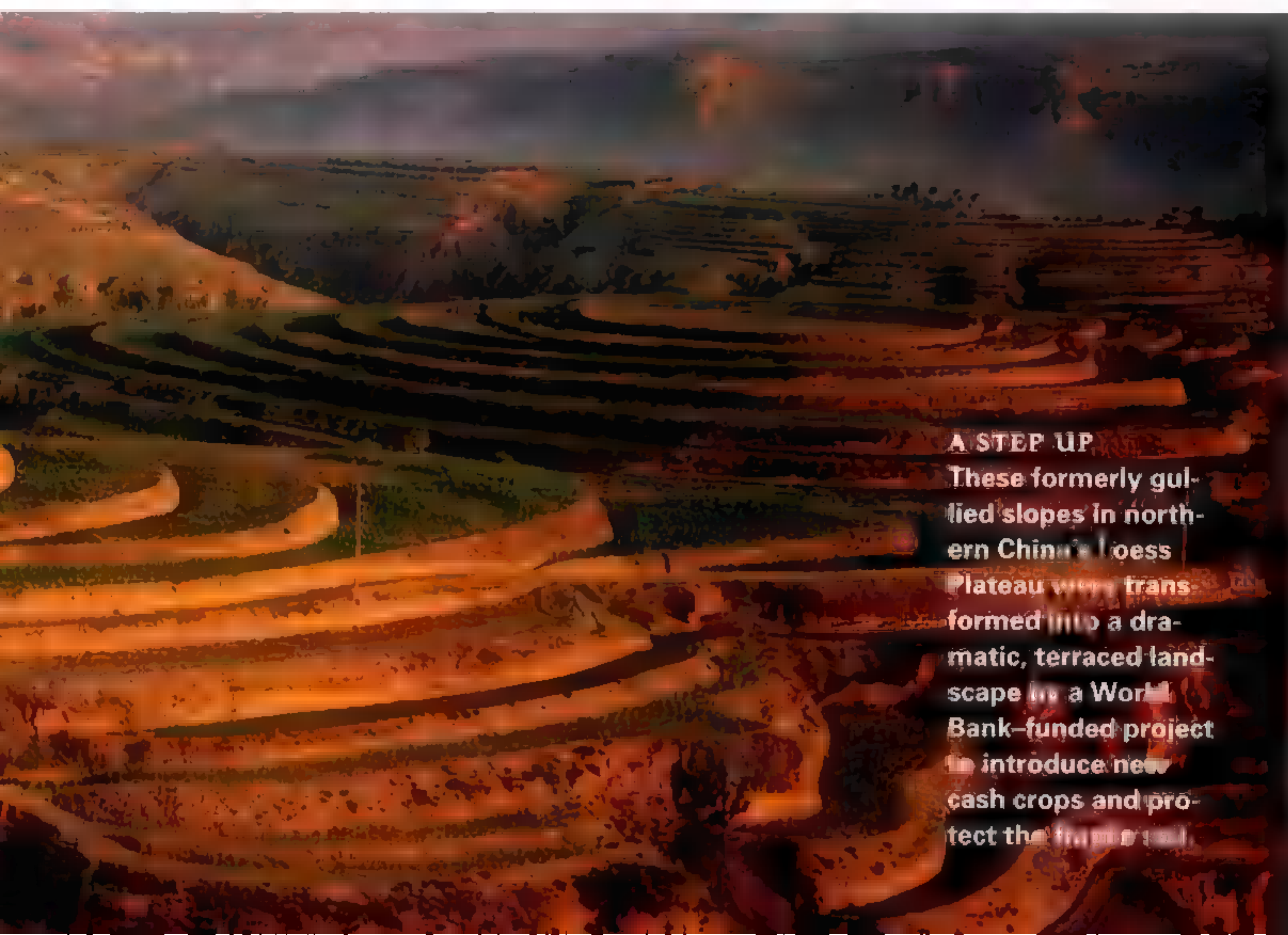
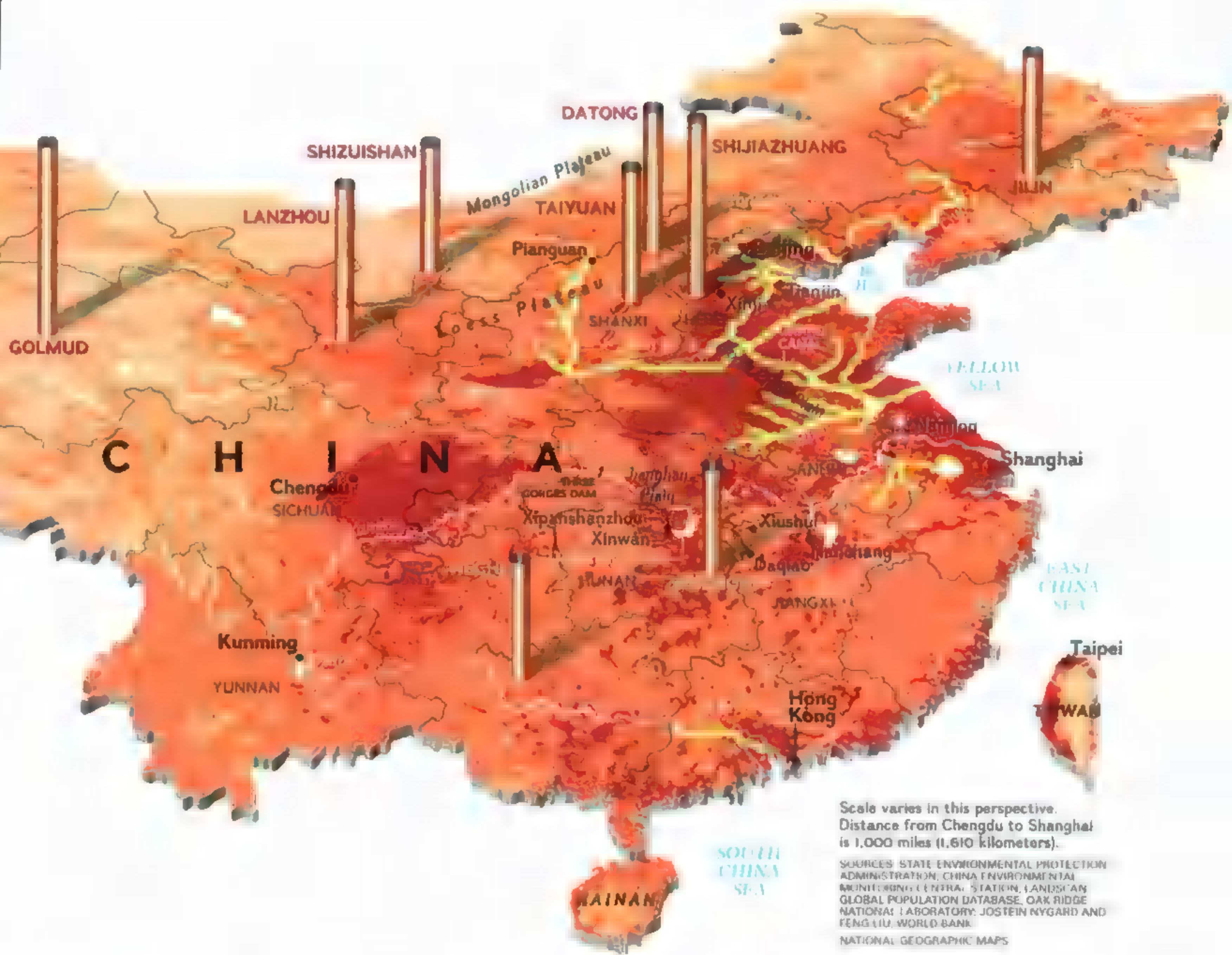
**J**ust as Daqiao illustrates the human toll of China's leap forward, tiny Naren's rags-to-relative-riches transformation presents a microcosm of a new and increasingly urgent challenge for the nation: finding a balance



#### TAINTED SPACES

Cities with China's worst air, as calculated by the government, are mostly in the north, where blowing dust combines with industrial pollutants. Most Chinese live in the east, an area transected by polluted rivers. Inadequate wastewater treatment and groundwater depletion have led to a national water crisis.





### A STEP UP

These formerly gul-  
lied slopes in north-  
ern China's Loess  
Plateau were trans-  
formed into a dra-  
matic, terraced land-  
scape by a World  
Bank-funded project  
to introduce new  
cash crops and pro-  
tect the fragile soil.



## STRANDED

Whimsical excursion boats rest on the bed of the heavily dammed Yongding River near Beijing, a city with chronic water shortages. The 800-year-old Marco Polo bridge, at rear, still draws tourists, though it spans a vanished stream.

# Two-thirds of China's major cities How the country deals with its water

between economic growth, which has averaged 8 percent a year for the past decade, and stewardship of the land and sea, the air, and the fresh water on which long-term human health and prosperity depend. When you consider that China has 1.3 billion people—more than four times the population of the U.S.—the implications of its gallop toward a Western-style consumer society are sobering. Last year Chinese added 1.8 million cars to their roads, bringing the national total to well over 10 million. At recent growth rates, the number could double every three to four years. Were car ownership ever to match that in the U.S. (135 million in 2002), there would be about 600 million on China's roads, more than all the cars in the world today.

As a foreign journalist working in China for more than a decade, I've been impressed by its material gains—and shocked by the associated environmental ills, which can be seen or smelled or tasted everywhere you go. You can read no end of reports and statistics about the problems, but experiencing their effects is quite different. A World Bank report spelling out that China has some of the worst soil erosion in the world takes on a whole new meaning when you're sitting at your desk—as I was in Beijing one recent spring day—and you glance out the window to see a vast and choking cloud of yellow dust rolling down the Avenue of Eternal Peace like a banshee let loose from the Mongolian steppes.

The erosion crisis, traceable back five decades to the agricultural policies of Chairman Mao Zedong, has been exacerbated by years of drought, turning the steppes and plateaus of northwestern China into a dust bowl. The dust storms that blow up each spring can sweep east across the Korean peninsula and Japan, eventually reaching across North America.

China may be getting richer as it turns into the workshop of the world, but as Beijingers rich and poor admit, what good is money if you can't breathe the air? If the economy keeps roaring along, within three decades China could overtake the U.S. as the world's largest source of greenhouse gases, associated with global warming (see chart, pages 90-1). China continues to rely on coal for 75 percent of its energy, spewing out some 19 million tons of sulfur dioxide a year (the U.S. produces 11 million tons a year) and contributing mightily to acid rain. People in barely a third of 340 monitored Chinese cities breathe air that meets national air-quality levels, which are below World Health Organization (WHO) norms. Indoor air pollution from coal burning takes more than 700,000 lives a year, and respiratory diseases cause nearly a quarter of all deaths in the countryside.

Bad as the air can be, lack of clean fresh water presents an even graver threat. Two-thirds of major cities are now seriously short of it, and as many as 700 million people drink water



contaminated with human and animal waste at levels that don't come close to the government's minimum standards (also below those of WHO). Most of the 20 billion tons of raw sewage produced in the cities each year—only 10 percent of which is treated—is dumped straight into rivers and lakes. Peasants who formerly used only human waste (night soil) on their fields now also apply nitrogen and phosphorus fertilizers, with the result that nutrient-laden runoff brews thick algae in rivers, lakes, and canals. Chinese scientists find a link between water pollution and the country's high rates of liver, stomach, and esophageal cancers.

All this made me wonder whether the

of abuses. China's shift away from old habits and attitudes has only just begun.

**A** plan to “unengineer” nature is one manifestation—a radical one—of new thinking at the top. After coming to power in 1949, the Communist Party, acting on the principle that “man must conquer nature,” built dams and irrigation works the length and breadth of the land. Peasants terraced slopes throughout the Yangtze and other watersheds, converting hillsides into fields and draining lakes for grain crops—the cornerstone of China's rural policies. With the stripping of vegetation, soil erosion and runoff increased, along with flooding—which worsened during the 1990s—

## are seriously **SHORT OF CLEAN WATER.** problems could affect us all.

Chinese have not so much been creating an economic superpower as committing ecological suicide. China's leaders may be wondering the same thing. “Never has the Chinese government put the environment issue in such an important position,” declared Xie Zhenhua, director of the State Environmental Protection Administration (SEPA), in a 2002 press report. “It is vital to the stability and the prosperity of our country and people.”

Certainly, if you look below the surface, you will find signs that a new consciousness is beginning to seep like rainwater through the layers of Chinese society. Not only are people coming to accept that the country's prosperity is bound up with caring for the environment, but they're now also aware that efforts at environmental protection are in turn bound up with improving systems of law and government. Good laws mean nothing when, as is often still the case, leaders don't have the will or means to enforce them, so some Chinese—those desperate enough—are testing the limits of political constraints through acts of civil disobedience. Others, meanwhile, are looking to the outside world for expertise and money to help with conservation projects. And still others are pioneering new ways of thinking about how to live more harmoniously with nature. But promising as all this is, it still seems that every environmentally friendly measure is offset by a greater number

shaking the leadership's conviction that the best solution lay in building still more dams and dikes.

The tipping point came in 1998, when the Yangtze burst out, killing nearly 4,000 people and displacing millions. If the floodwaters had risen just a few inches higher, loss of life and property damage would have been immeasurably greater. Then premier Zhu Rongji's response to the catastrophe was a milestone in Chinese environmental policymaking. Even as the monumental Three Gorges Dam project was further subduing the Yangtze, Zhu set in motion an extensive ban on logging natural-growth forests; a massive Yangtze watershed reforestation project (terraces on all hillsides steeper than 25 degrees to be replanted with grasses, bushes, and trees); and a ten-year program, affecting 200 million peasants, to convert fields back to pasture, forests, lakes, and wetlands (the last having shrunk by nearly two-thirds since 1949).

The plan for reflooding Yangtze wetlands—an integral part of the Asian flyway for swans, herons, storks, ducks, geese, cormorants, egrets, and Siberian white cranes—entails moving about 2.5 million people onto higher ground or into small rural townships. With Zhang Chen, a conservationist from the World Wide Fund for Nature (WWF), I went to Dongting Lake, which spreads across the Jiangnan Plain in the middle reaches of the Yangtze. After 1949 the government built hundreds of miles of dikes here,



## CAUSE AND EFFECT

**Acrid plumes from a factory** in Pianguan are the billowing signal of one of China's greatest health threats—air pollution. Nearly two-thirds of Chinese men smoke, including a Hebei resident (above right) with neck lesions that he claims are the result of a toxic environment. Women, with far lower smoking rates, suffer equally from diseases like lung cancer and bronchitis, a measure of the pervasiveness of dirty air





indoors and out. Rising incomes are sending up another environmental red flag: The Chinese are eating more meat, like the pigs (below left) being processed at a new slaughterhouse in Sichuan Province. More livestock production means more nutrients from animal waste and fertilizer seeping into rivers and lakes, causing algae blooms. The result is eutrophication. The process turns lakes green, may suffocate fish by depleting oxygen, and can harm people who use polluted bodies of water, such as Dian Chi (below), a lake in Yunnan Province, as a source of food.



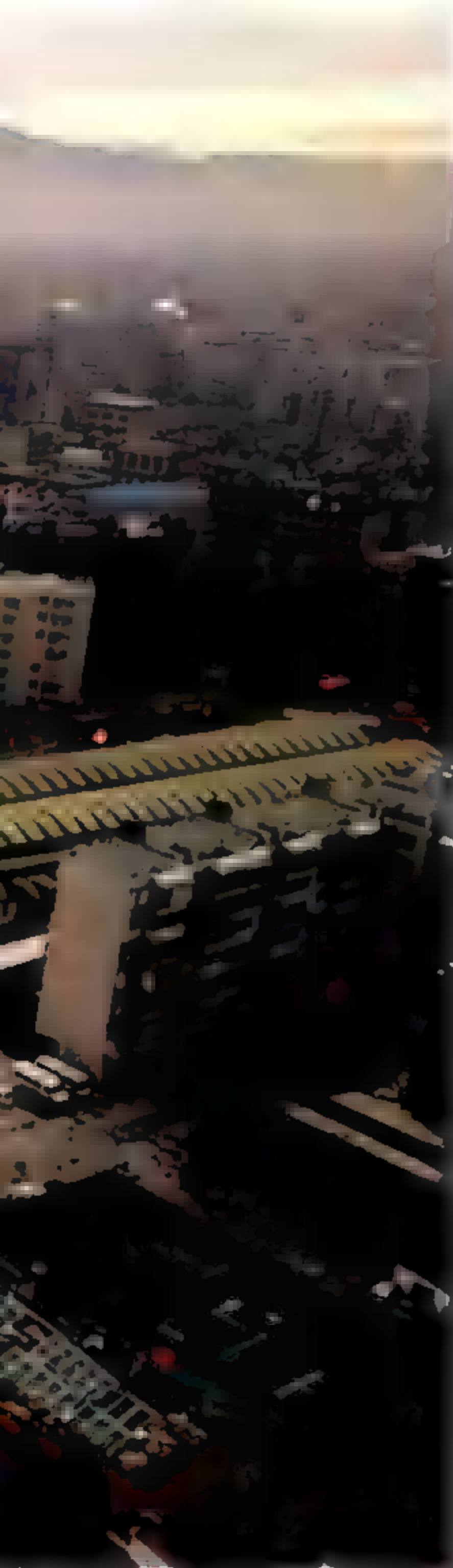


## More than 25 million workers are in poisonous material. What good is money

draining the lake—which then shrank to less than half its original size—to create farmland. What was left filled up with so much silt washed down from the Yangtze's headwaters on the Tibetan Plateau that it lost most of its capacity to absorb the summer floods.

As we sat on a ferry chugging out to an island of reclaimed land, Zhang said that the WWF got involved in the restoration project because the lake had been such an important breeding ground for migratory birds. The birds had all but disappeared by the 1990s, and playing a part in bringing them back was what got Zhang involved. "I dream one day of seeing a beautiful sight of thousands and thousands of wild birds on the water," he said.

After meeting up with a local resettlement officer, we set off along the top of one of the dikes. I soon caught sight of three families busily dismantling their houses, which stood in the lee of the 24-foot-high earthen wall. The peasants were removing their roof tiles and carefully stacking them next to piles of bricks. Later, over tea and cigarettes, they told me they were about to move and would rebuild their houses, using the same bricks and tiles, at Xinwan, a township four miles away. "The government is very good. It helps people," said Zhang Yunzhang, an elderly man with a fine white goatee, keen to butter up the resettlement officer. As the one responsible for certifying the move on behalf of the government, our traveling companion was supposed



**TECHNOLOGY FIX**  
Solar water heaters arrayed on Kunming rooftops gleam with the sun's last rays. Efficient, economical, and increasingly popular, the heaters lessen dependence on coal, which still blankets the city in smog.

vicinity used to sell their crops to the state, so Zhang Chen's task is to propose other, flood-adapted ways for peasants to make a living. One of his props is a blackboard marked up with charts demonstrating how it's possible to earn a higher income from farming fish or breeding pigs than growing crops in the floodplain.

We drove on to the nearby village of Xipanshanzhou, where 177 families had already made the transition. We saw fish pens and domestic ducks floating on the waters that now cover former fields.

"Hey, look at that!" Zhang suddenly shouted, and, following his gaze, I watched a pair of white egrets coming in to land. "You see, they *are* coming back." Indeed during the past two winters some 400 swans and other birds from as far away as Siberia have been spotted at the lake.

As Zhang Chen sees it, the Yangtze floods of 1998 were a blessing in disguise, encouraging Chinese leaders to think differently about nature. "The floods made a big impact on public awareness—the environmental message is easier and easier to get across. People could grasp the scale of the problems." Now the unimaginable is happening: China's leaders have shown they're capable of kicking the habit of massive engineering projects and returning land to its original state. "Finally," said Zhang, "the government recognizes the value of the wetlands."

## regular contact with TOXIC DUST and if you CAN'T BREATHE the air?

to give each family 20,000 yuan (\$2,500) as compensation.

Old Zhang remembered how when the dike had been built back in 1958, it had been a joy to come here and benefit from the newly reclaimed land. Yet during the past decade the peasants had had to spend more and more time and money building the dike higher and higher. The summer floods seemed only to get stronger, and when, as so often happens, the dike was breached, the rice and cotton crops were ruined. In 1998 not only had the old man's house been submerged but all his family's livestock drowned. "Now," he said, "we are all willing to go."

Zhang Yunzhang and other farmers in the

**T**he Chinese government, in fact, has gone even further. In 1998, for the first time, spending on environmental protection exceeded one percent of the gross domestic product—a significant milestone. China has not only admitted the gravity of the nation's problems but is now accepting help in various forms from the outside world. The WWF project is one example. Financial and technological assistance from the government of Japan is another. Japan, which suffers downwind acid rain effects from China's sulfur dioxide emissions caused by coal burning, has given smokestack scrubbers to power plants in Shanxi Province, where a quarter of the nation's coal is mined. During the mid-1990s the central government took steps to

## BAD AIR QUALITY caused nearly two million deaths in the past decade.

reduce coal burning nationwide. As a result, SEPA reports, sulfur dioxide emissions have fallen from more than 23 million tons in 1995 to 19 million today.

Taiyuan, Shanxi's capital and one of China's most polluted cities, reports that in 2002 it had 153 days with "fairly good air"—33 more than the year before—and that levels of particulate matter are dropping. To further improve its air, the city has authorized emissions trading, in which plants using cost-effective pollution control devices can sell excess reductions—emission "credits"—to operations with higher costs. Taiyuan says it wants to halve its sulfur dioxide emissions by 2005, but unless individual plants willingly spend money on pollution controls, this is a pipe dream. All too often, the policymakers use statistics as a drunk uses a lamp-post—for support rather than illumination.

China has written a slew of environmental laws and regulations since 1979, but it wasn't until the formation of a government ministry (SEPA) 15 years ago that some coherence was brought to the complex business of combating pollution and protecting nature. Even so, putting laws into practice remains difficult. "Our legal system is far from perfect," says Xu Kezhu, who teaches environmental law at China University of Political Science and Law. Xu also volunteers at the Center for Legal Assistance to Pollution Victims. (Largely run by students out of a small apartment on campus, this hotline has received more than 5,500 calls since it opened in 1999.)

For various reasons—mainly greed and lack of public funds—China's laws are often weakly enforced, or not at all. In the industrial city of Kunming, for instance, polluters whose effluent gushes untreated into a lake called Dian Chi are rarely made to pay the fines imposed by the local office of the environmental administration. It's common for officials to manipulate data on the lake's effluent levels to make them match claims of success. Once, a monitoring station was even moved from one end of the lake to the other, cleaner, end to get better readings.

Shenanigans like these are fueling new skepticism about the government's ability to ameliorate or solve environmental problems from the top down. This disillusionment, if translated into widespread civic action and public disobedience, could have profound implications for China, perhaps even forcing open the political system as no other protests have yet done.

**S**ince the student protests at Tiananmen Square in 1989, the Communist Party has been more nervous than ever of public demonstrations, which can spawn organized opposition groups, as was the case in the former Soviet bloc. So when aggrieved Chinese take to the streets, protest leaders can expect the harshest penalties.

But as the tragic story of the silicosis-ravaged gold miners of Daqiao shows, when ordinary people's lives are in jeopardy, fear of authority diminishes. For these citizens, their government's failure to honor the rule of law amounts to a breach of trust they're unwilling to passively accept. In 1998 a group of the miners took the county government to court, claiming financial recompense for the harm they'd suffered. Surprisingly, given the odds against such a challenge to the system, they won. Yet three years later none of the claimants had been paid more than half the stipulated award, which averaged around \$3,000 a person, roughly equivalent to the income they'd earn in ten years.

On April 4, 2001, the miners—who had heard that Meng Jiangzhu, the newly promoted party secretary of Jiangxi Province, would be paying them a visit—decided to block the road, hoping to waylay his car and hand him a petition pleading for further assistance. "The government is the mother of the people," the statement began. Hundreds of villagers waited throughout the day for Meng, but he never came—or at least they never saw him, because the police swooped in to drag them away. Some villagers were fined, others detained.

Because the miners seek every chance to tell the outside world what has befallen them, they



## **SMOKEOUT**

**Savory smells aren't all that waft from the smokestacks of kebab stands in Kunming. Widespread use of coal for cooking and heating exposes the Chinese to choking particulates, acids, and dangerous organic compounds.**



## SOLUTIONS TAKE ROOT

The cost of environmental harm has become clear, and China has taken some action to restore soil, water, and air. Denuded slopes above a tributary of the Yangtze River in Yunnan Province (above) attest to years of clear-cutting. The practice was the main cause of floods that have killed thousands of people along the river in the past decade, with a one-year high of nearly 4,000 deaths in 1998. Forestry officials hope







to stop floods and arrest erosion by planting trees on slopes in major watersheds. Near the Yellow River (above) thirsty seedlings get a splash of water. Another challenge for China is skies dirtied by burning fossil fuels—the source of 75 percent of the nation's energy—processed at plants such as one in Shanxi Province (below left), where workers stack coal bricks. But winds of change are blowing: Gusts in the Xinjiang region whip up sandstorms and cause erosion but can also be harnessed—as at the Dabancheng wind farm (below), China's largest, which now generates a token contribution to the area's electricity.





#### ADVERTOPIA

The child actors are Chinese, but the sleek set of a powdered-milk commercial in Shanghai evokes Scandinavia more than it does a traditional Chinese home—evidence of the allure of the outside world.

were eager to meet me. Soon after arriving in Daqiao, I was approached by a dozen local officials, who politely but firmly asked me to leave. Explaining that I'd accepted a dinner invitation from the villagers, I insisted on staying, and the officials left.

Over a meal of chicken claws and rice, the villagers pleaded with me to help in their fight for justice—both by writing about their plight and by taking their petition to Beijing. The miners were demanding full compensation, free education for their children (the cost of educating a child through seven years of primary school is about \$90), and the right to be considered as handicapped so they would be exempt from taxes.

Dinner over, I left in the darkness, with the petition in my pocket. After turning onto the main road outside Daqiao, I was stopped at a police blockade, in the midst of which stood several of the officials I'd encountered earlier. They beckoned me out of the car, at which point a crowd of villagers who had followed me started attacking the officials, punching one in the face and wrestling with the police. Anxious to avoid provoking a full-scale riot, I asked my driver to leave in a hurry.

We crossed into the neighboring province of Hunan, where, after driving several hours, we were stopped at another roadblock. I was taken into the police station, and eventually, around three a.m., six or seven officials arrived from Nanchang, the capital of Jiangxi Province. They wanted me to promise not to report the miners' story and made me hand over the petition as well as all my film and notes. As we argued over

whether I should sign a confession that I'd broken regulations by visiting Daqiao without their permission, a curious thing happened.

A couple of the officials began trying to justify the treatment of the silicosis sufferers by engaging my sympathy for their own difficulties. They said county governments in Jiangxi, a poor rural province, were bankrupt and often unable to pay the salaries of their own staffs. In these circumstances it was a constant struggle between putting into effect grand plans hatched in Beijing, such as compulsory education, and trying to hold down rebellious peasants desperate to find a way out of poverty and sickness.

They had a point. Since 1978, when China's centrally planned economy began to be dismantled, local governments have been left to run their own affairs and find their own means to raise revenues. This they do by becoming

**“If everyone . . . lived like Americans, then you'd need three planet Earths . . . to sustain that level of consumption.”**

-PETER RAVEN, BOTANIST AND CONSERVATIONIST

entrepreneurs themselves, investing in rural enterprises—logging, mining, manufacturing, food processing—and usually trying to find a shortcut to profits by flouting health and safety laws or environmental regulations. When these commercial ventures fail, as often happens, rural governments are left with ballooning debts.

This creates a paradox: China's communist rulers in Beijing wield absolute power, and few people dare defy their edicts openly. But the edicts from on high are as likely to be honored in the breach as in compliance, with local governments reporting upwards that they have dutifully fulfilled the ambitious targets. To make these lies stick, they do everything in their power to prevent citizens from bypassing the bureaucratic ladder and asking Beijing for help.

And so the miners of Daqiao, who are known as the "living dead," keep trying to make their appeal to the top. Their attempts to persuade the Xiushui government to pay up in full, as ordered by the court, are all the more agonizing because they know that the officials have only to wait them out, and they'll all be dead.

**T**he luckier ones are those like the people in Xinji in Hebei Province on the North China Plain, where thousands of small, family-run tanneries sprang up during the 1980s, capitalizing on the area's long tradition of leathermaking. (Overall, China, with two million leatherworkers, is the world's largest producer.) In Xinji you can see how the twin agents of urbanization and globalization are transforming China—and how steps, albeit inadequate ones, are being taken to clean up industrial pollution.

Home to more than 200 million peasants, who grow half of China's wheat, the North China Plain is an expanse of rich, loamy soil extending from Anhui Province to Hebei. Traditionally people here have lived in myriad small, muddy villages made up of flat-roofed, redbrick houses, each enclosed by a high wall surrounding a yard where they keep a few pigs and chickens.

But in recent years large numbers of peasants have been moving to new towns, like Xinji, that are imbued with the utopian vision of China's urban planners. With a population of 650,000, Xinji has wide streets, big squares, numerous high-rise apartment blocks, and large public buildings sheathed in white tiles, giving it an empty, half-finished feeling.

One of the town's star businessmen is Xie Shaoming, who joined China's super-rich after establishing a tannery when he left school at 14. Over four decades he built it into an enterprise that employs 1,100 workers in a new industrial park near the town. Xie is a man of few words, a bit shabby looking in his rumpled suit, and as he showed me around the plant, he exuded the genial air of one whose success has taken him by surprise. "Thanks to the government's policy on private business," he said modestly, "we ordinary people have become rich."

The tannery washes and treats 30,000 sheepskins a day, most imported from Australia or New Zealand. The skins then go to other factories in Xinji to be made into faux Gucci bags or leather jackets and skirts for export to Russia, Eastern Europe, and the U.S. Because of the quantity of detergent used in washing skins, and

	CHINA	U.S.A.
AREA	3,705,820 square miles	3,717,796 square miles
POPULATION	1,288,700,000	291,500,000
PERSONS per square mile	348	78
CARBON DIOXIDE EMISSIONS per person	2.5 metric tons	19.8 metric tons
ENERGY CONSUMPTION per person	880 kilograms oil equivalent	7,960 kilograms oil equivalent
TOBACCO USE	35.6 percent	23.6 percent
MEAT CONSUMPTION per person	104 pounds	269 pounds
PAPER CONSUMPTION per person	73 pounds	730 pounds
AVERAGE NUMBER OF PERSONS per room	1.1	0.5
WATER USE per person (agricultural, industrial, domestic)	116,000 gallons	484,500 gallons
TV SETS PER 1,000 persons	292	844
VEHICLES PER 1,000 persons	16	774



Is it Polo?  
是嗎?

引领时尚 全球共享

**PEOPLE'S CAR**  
A streetside display woos would-be motorists in Beijing. Car ownership hit ten million in 2003—tiny by Western standards but the tip of an emerging iceberg in China, where some cities' air already thick with exhaust.

大众

引领时

全球共享



Polo





## The HOPE of many Chinese is to affluent city people

because toxic metals like chromium are used in treating leather, the industry produces huge volumes of wastewater. More often than not the polluted water is dumped straight into local rivers or, worse, pumped underground. As a result municipalities are having to drill deeper and deeper to find clean water.

Xinji has made some progress toward cleaning up its water, having built a canal to collect wastewater from Xie's and other nearby tanneries and take it to two treatment plants installed and run by the town. Xie and the other tannery owners pay 80 percent of the 100-million-yuan (12-million-dollar) cost of water treatment each year. Xie said he has no objection. "We should contribute what we can afford

back to the government. The most important thing businessmen should bear in their minds is morality. We should take the lead in protecting the environment."

But morality goes only so far: Outside the tannery a telltale whiff emanated from stagnant, pitch-black water in a roadside ditch. "Oh, that's from other factories, not the tanneries," Xie said with a shrug. Many polluting businesses in Xinji ignore the rules because the penalties, when enforced, are so low.

After our tour, Xie insisted that I see his house. He walked me over to his fleet of ten cars lined up outside the factory garage. "American," he said, pointing to the Cadillac. "German," he said, as we got into the BMW. His house, luxurious



### BIG PLANS

**A giant poster in a Beijing sales office promises the good life at a luxury apartment tower. Though their rulers have tempered the ethos of build wealth now, clean up later, China's people hold fast to visions of a world-class living standard. The wealthier West—mindful of global harm that has resulted from its own environmental sins—looks on nervously.**

and how that inevitably seems to mean replacing one type of problem, poverty, with another, resource depletion.

Short-term cures for some of the country's growing pains are found in innovations like new sewage plants or natural gas pipelines to reduce dependence on coal. Other fixes now in progress—like Zhu Rongji's plan for reversing the damage to forests, lakes, and prairies—demand new thinking and decades of patient effort. But when the stresses are extreme, as with water, the tendency still seems to be to turn back toward gigantic engineering projects, such as a scheme now under way to channel water from the Yangtze more than a thousand miles north to Beijing and Tianjin. The environmental effects of audacious projects like this are unknowable.

Ultimately, how China deals with its water problems could affect us all. For instance, if the water shortages farmers are now experiencing in the North China Plain cause grain harvests to decline significantly, the country may need to meet its growing demand for food with imports so large they could capsize world markets, driving up food prices.

As I left Xinji, a huge billboard caught my eye: "Pollution-free green vegetables." Back in 1985 when I first came to China, fresh green vegetables were a treat, and factory chimneys belching smoke were a point of pride—a sign that China

## copy the lifestyles of ALL OVER THE WORLD.

by any standard, was a three-story mansion in a gated villa community for the town's nouveaux riches. "Japanese?" I asked, as we admired the huge flat video screen hanging on one of the living room walls. "No, Philips," he said, referring to the Dutch company. I pointed to the white marble floors. "Chinese?" "No," Xie replied with a grin, "Italian."

**C**hinese aim to copy the lifestyles of affluent city people all over the world—splurging on gas-guzzling SUVs and the latest electronic gadgetry, eating high-calorie foods, and using copious amounts of water in their homes. As Xie drove me back to the tannery, I thought about China's growing wealth

was modern and industrialized. No one knew or cared about the consequences.

The state is still building monumental projects, but the market gardeners advertising their vegetables are also on to something big. Some Chinese now want to enjoy a cleaner, healthier environment, and they're willing and able to pay for it. That may not sound like the stuff of a stirring revolutionary slogan, but, just think: What if all 1.3 billion Chinese shared the same wish? □

**WEBSITE EXCLUSIVE** Imagine if every family in China had two cars, and every person ate 269 pounds of meat a year, like Americans. Join our discussion forum. Read field notes and view more images at [nationalgeographic.com/magazine/0403](http://nationalgeographic.com/magazine/0403).



**GRANT**

**Michael Garstang**  
**Meteorologist**  
**Etosha National Park,**  
**Namibia**

"A meteorologist contributing to experimental biology? It's unheard-of."

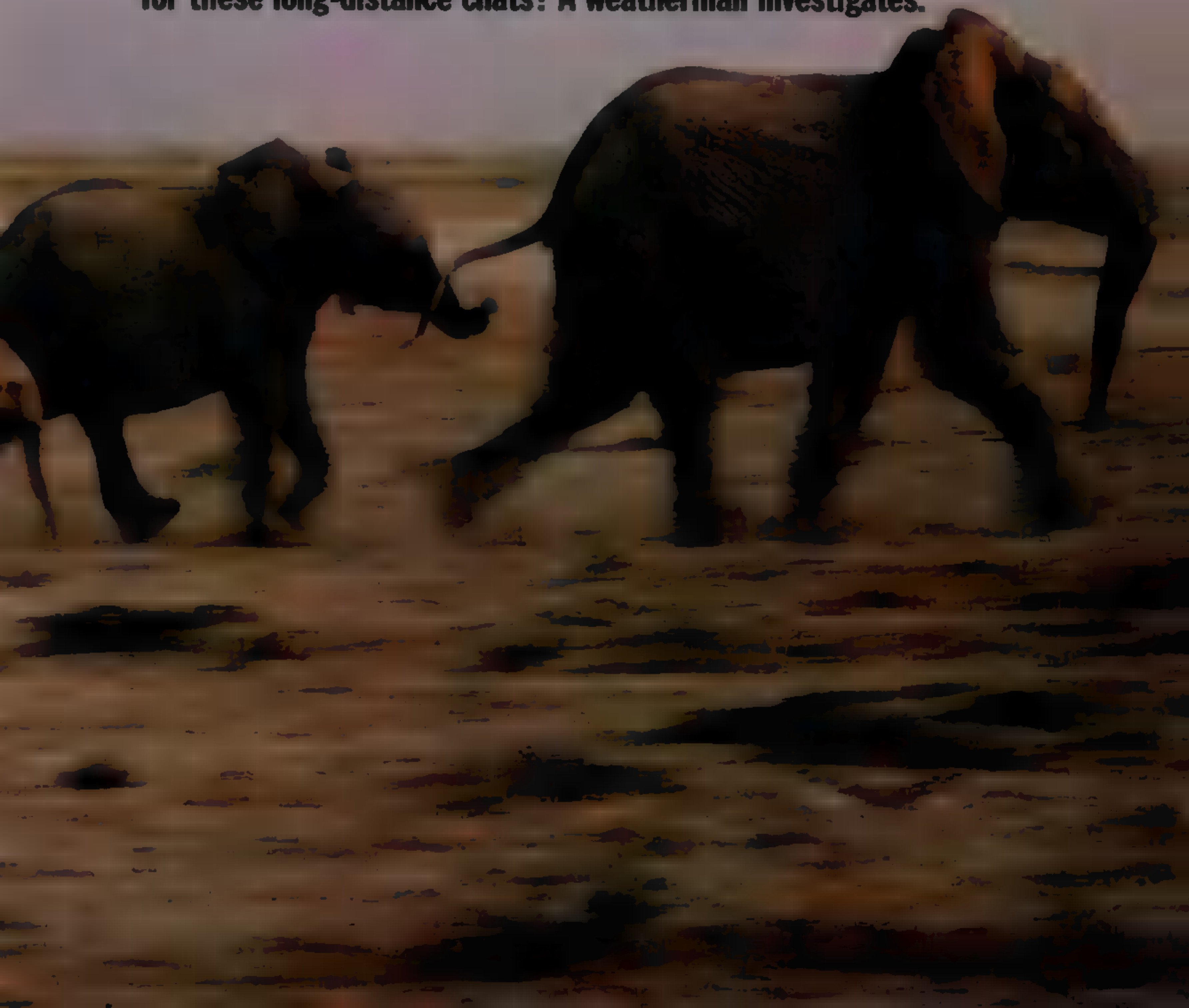
Baby elephants quickly learn to understand their elders' resounding instructions, like the low-pitched rumble that sent this group hurrying toward a nearby water hole.

WYNAND DU PLESSIS



# calls<sup>in</sup>the

**With booming bass voices—and the right atmospheric conditions—elephants can communicate across miles of savanna. What's prime time for these long-distance chats? A weatherman investigates.**



By Lynne Warren

NATIONAL GEOGRAPHIC WRITER

**M**idday sun scorches the plains of northern Namibia, and a female elephant just coming into estrus is making a racket. With a rumble loud enough to rival a jackhammer, she broadcasts her availability for mating. But gusty winds and turbulence created by heat shimmering through the atmosphere tend to break up the sound waves she generates, so her signal carries little more than half a mile. The odds are slim that a mature male in his own period of reproductive readiness will be close enough to hear her call.

Hours pass. Dusk settles over the flat sand veld. Winds calm, and air near the ground becomes cooler than the warm air above it, effectively creating a channel for sound. Now the low-frequency end of the eager female's cries can carry six miles in all directions, reaching the ears of elephants spread over a range of more than 110 square miles. The chance that a tall, strong mate will come swaggering her way is now a pretty sure thing.

To understand how elephants make the switch from local to long-distance calling, it helps to know something about weather. Wind and heat—along with rough terrain and dense



JOHAN LE ROUX

**“Elephants live in a complex social world,” says Cynthia Moss, founder of the Amboseli Elephant Research Project, a long-term study based in Kenya. In tight-knit groups of females and young, sight and touch—like the dusty rubbing at right—transmit powerful messages of belonging. But a full-grown male (above) lives mostly on his own. Long-distance signals carried in the deep-voiced calls of other adults keep bulls connected to local herds.**

vegetation—limit animal calling ranges because they disrupt sound waves. Wind can also be a problem for the receiver: Gusts blustering over elephants' massive heads and floppy ears can make it difficult for these distinctly non-aerodynamic animals to hear any signal clearly. High frequencies (think bird whistles and chimp chatter) are even more easily disturbed than low frequencies (elephant rumbles and lion roars).

The link between weather and sound has long intrigued Michael Garstang, a University of Virginia meteorologist with a tool kit full of weather instruments, a detailed grasp of how

atmospheric patterns can affect acoustics—and a fondness for elephants.

Though Garstang has worked in the U.S. for decades, he was born in South Africa and retains an enduring fascination with the wild creatures of his youth. He began to pore over scholarly reports on elephant communication, work based on research in zoos and in the wild. The papers showed that long-distance elephant calling relies on ultralow tones classified as infrasound—frequencies below the bass threshold of human hearing.

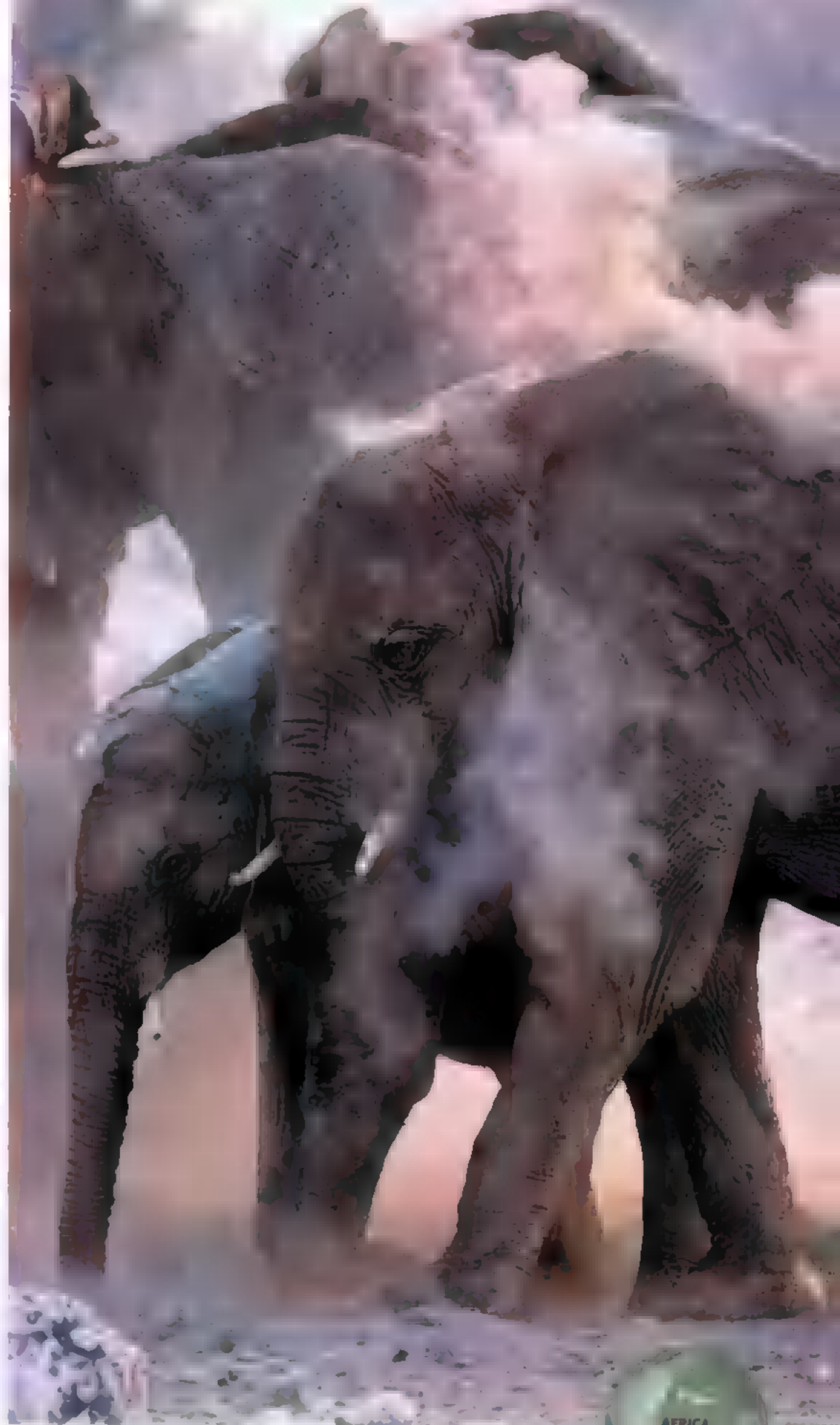
Garstang became curious about whether elephants waste energy bellowing against the

**“As the sun sets and the ground cools, the calling range of savanna elephants can triple in as little as two hours.”**

**MICHAEL GARSTANG**

wind, or whether they take advantage of daily atmospheric changes that can boost bass tones like the woofers in stereo speakers. To find answers, he assembled a team of researchers and headed to Etosha National Park in Namibia, home to ■ healthy and growing elephant population. Hills and forests aren't part of Etosha's savanna habitat, so Garstang knew that weather, rather than terrain, would be the most significant environmental factor affecting the elephants' lowest pitched communications.

In the dry season large numbers of elephants gather to drink and bathe at water holes along the eastern end of Etosha. Near the park's Mushara water hole, the team installed an array of infrasound-sensitive microphones and ■ suite of weather instruments. Devices mounted on a 24-foot-



WYNAND DU PLESSIS

tall tower collected near-ground data about heat and wind. The same gear also gathered data on air pressure and humidity, but those factors had little effect on infrasound transmission. A tethered balloon (being tugged into position by Garstang in the inset on page 96) lifted sensors into the air. And



**THE PROJECT**

**LOW-FREQUENCY ELEPHANT VOCALIZATIONS RECORDED:**

MORE THAN 1,300

**CALLS RECORDED BETWEEN EARLY EVENING AND EARLY MORNING:**

96 PERCENT

**AREA OVER WHICH ELEPHANTS CAN COMMUNICATE VIA INFRASOUND:**

AT LEAST 110 SQUARE MILES



**A spectacular Namibian sunset owes its red blaze to dust that floats in the atmosphere and scatters the fading light. Rumbles, trumpets, and screams echo through the twilight—an elephant communication network shaped by shifting patterns of heat and wind.**

an acoustic sounder measured temperature and wind velocity from the surface to a height of about 650 feet. Over a period of nearly three weeks, the team recorded more than 1,300 low-frequency elephant calls and the atmospheric conditions in which they were made.

Elephants can talk in a broad range of frequencies—sounds as high as the top note of a clarinet and lower than the lowest note on a concert piano.

At the bass end of the scale, they can produce some of the lowest frequencies in the animal kingdom. Human ears can detect frequencies down to 20 hertz (Hz), but elephants can produce calls as low as 15 Hz. Most of the conversations recorded at Mushara were held in voices so deep that people couldn't hear them at all.

Daytime temperatures at the site rose to over 110°F, and the wind regularly blew at more



CLAUDIA DU PLESSIS

than 20 miles an hour. In the evening, temperatures dropped below 40°F, and for hours the air was almost still. Ninety-six percent of the infrasonic signals Garstang's team recorded occurred in the cool calm between dusk and dawn. The greatest number of calls happened from an hour before sunset to three hours after, with another talkative period in the first two hours after sunrise.

Those early morning and

early evening peaks in calls support the idea that elephants have indeed adapted their behavior to match patterns of change in the atmosphere. Garstang succinctly sums up his findings: "Elephants talk most when conditions are best."

That adaptation ■ crucial, since calling range helps determine the size of the area used by elephants at any given time. Long-distance vocalizations keep group members bonded

as they trade information about resources and dangers and seek breeding partners across pachyderm-scale areas. Knowledge about how elephants communicate, Garstang says, can help us protect their habitat—and their future. □

**WEBSITE EXCLUSIVE** Do you want to learn more about elephant talk? See recommended websites and a bibliography ■ [nationalgeographic.com/magazine/0403](http://nationalgeographic.com/magazine/0403).



The ringing silence  
of Canada's Stikine River Valley  
can stir your soul.

Deep

# North

By Wade Davis

Photographs by Sarah Leen

*Armed with a .30-30 rifle—and with the myths and reverent spirit of his Tahltan ancestors—Oscar Dennis guides a traveler into British Columbia's unnamed Stikine River basin.*



Ambling near Alaska's border, *the Stikine River, top, meets the Iskut. This scene*





*may soon change: A plan to divert the Iskut for electricity could bring development along its length.*



Bearing the rack and cape of a caribou to a sport hunter in Spatsizi Plateau Wilderness

return for the wild: grizzly bears  
and white wolves and clouds  
of cottonwood down.



*Park now comes naturally to guide Kate Auerbach, who gave up city lights for the northern lights.*

**I**t took more than an hour to find the old grave, now hidden beneath a spruce sapling, its wooden headstone no longer legible, its picket fence a mere shadow on the soil. "Love Old Man Antoine Died 1926" was the simple inscription. I knew it from memory, having stumbled upon the site as a young park ranger, part of the

first team hired in 1978 to explore and map the newly created Spatsizi Plateau Wilderness Park. Often described as the Serengeti of Canada, the Spatsizi is British Columbia's largest roadless preserve, more than 1.6 million acres encompassing the headwaters of the mighty Stikine, the river known to the native Tlingit as simply the Great River. The mist and rain that swirled about Antoine's grave would in time swell the headwater lake of Laslui, giving rise to a wild mountain stream that flows first east and north before turning west and finally south on its 400-mile run for the sea.

Along the way the river plunges into the depths of the Grand Canyon of the Stikine, a raging torrent that flows more than 60 miles beneath cliffs of basalt and sedimentary rock rising a thousand feet straight up from the water's edge. Below the canyon the river runs wide, cutting through the glaciers and jagged peaks of the coast mountains before finally reaching a pristine estuary where each spring bald eagles gather by the thousands to feast on sparkling runs of smelt. When John Muir traveled the lower third of the Stikine in 1879, he called it a Yosemite a hundred miles long, and he counted some 300 glaciers along its tortuous course. It's a land where Canada could hide England, and the English would never find it.

My job description had been vague: wilderness assessment and public relations. In two seasons I saw a handful of visitors. My partner and I explored the park freely, mapping the trails used by outfitters and by caribou and sheep.

In these wanderings we had come upon Antoine's grave, perched on a bench above the willow and birch thickets that hugged the shore of Laslui Lake. Curious about the history of the

grave, I had crossed the lake to the mouth of Hotlesklwa Creek, where Ray and Reg Collingwood, outfitters for the Spatsizi, had established a hunting camp. There I found Alex Jack, a legendary native guide, whose birth name means He Who Walks Leaving No Tracks. Alex knew of the grave, and he knew who had laid the body to rest: his own brother-in-law. Old Man Antoine, Alex told me, was a shaman, crippled from birth but filled with the power of clairvoyance.

Intrigued by this link between a living elder like Alex and a shaman born in a previous century, I left my job with the government and went to work for the Collingwoods. As Alex and I cut wood and fixed fence and led the odd hunter after moose or goat, I would ask him to tell me the old stories of the land and his people. He talked of his youth, of hunting trips and winter trading runs by dogsled to the coast. But of the myths of his people he appeared to recall nothing. He spoke often of survival, of winter winds so strong the caribou froze, of times when his people ate nothing but spruce bark. I remember passing an encampment on a sunny afternoon, and Alex acknowledged that his people had settled there for several years, but he didn't describe it as a place they had lived. "Here," he said simply, "is where we survived."

One morning I went out to retrieve the carcass of a moose shot by a hunter. Strapping a canoe to the float of his plane, Ray Collingwood had dropped me beyond Laslui, further up the valley at the head of Tuaton Lake. A pack of wolves drew me to the kill. When I returned with a canoe full of meat, Alex was waiting. As we unloaded, he said quietly that he remembered a story. To this day I do not know what, if

# Solitude Country

Each of the area's perhaps 2,000 residents can claim ten square miles of elbow room on average, making the Stikine River drainage one of the most sparsely settled regions of North America. But change is coming: Gold and silver mining companies have stepped up their exploration in the region.

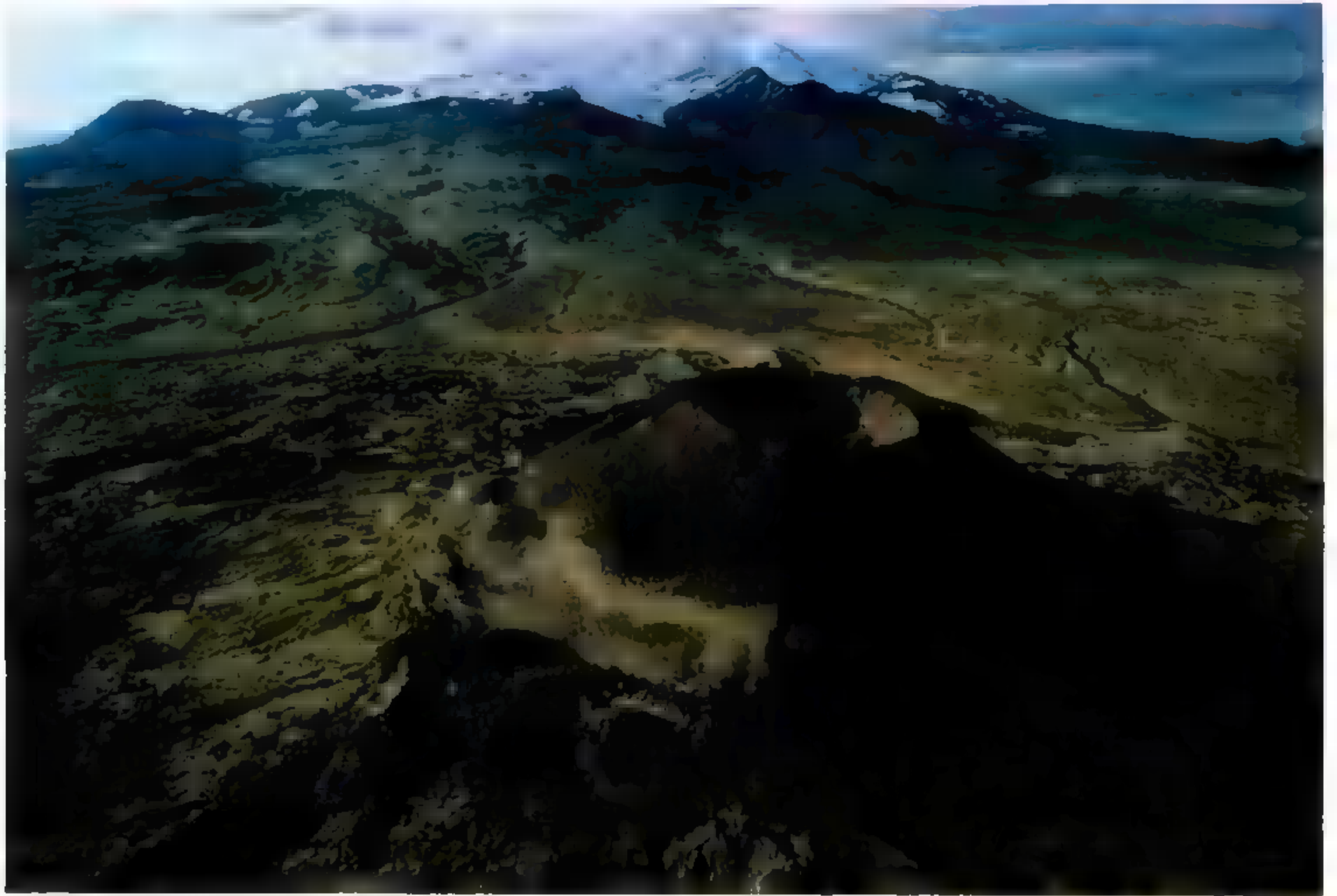


At the peak of the last gold boom in 1898, mining supplies chugged north toward Klondike country on stern-wheelers (below left) that docked at Glenora. Upstream, Telegraph Creek (below right) was built on the failed hope of becoming a link on an intercontinental line.



BRITISH COLUMBIA ARCHIVES





**Eve Cone** and ice-covered Mount Edziza punctuate a landscape of fire and ice. Beneath the thousand-foot gorge of its Grand Canyon (right), the Stikine churns through continuous rapids for 60 miles. Only 26 kayakers—all expert—have successfully run them.

anything, was the significance of the gift of meat. But that night I began to record from Alex a long series of mythological tales. It was the beginning of a friendship that would last until his death at the age of 92.

**R**eturning now to the Spatsizi, two years after Alex's passing and more than two decades since we first met, I found his memory everywhere, in the willow thickets and along the streams, in the wind and the scent of the fire haze that softened the sun, upon the open prairie where the Collingwood horses grazed, their manes quivering like sheets of distant rain. The land, of course, was unchanged: a broad mountain valley draining to the east, cerulean lakes beneath the dome of a vast sheltering sky, soaring undulating ridges running away to the north and south, uplands skirted at the base in white spruce forests, their skylines dusted even in summer with fresh snow.

One thing that had changed was the scale and character of the Collingwoods' operation. Nestled in a hollow on the southern shore of

Laslui, their main lodge and outbuildings fronted a small fleet of floatplanes that each morning carried clients to quiet waters, which, more often than not, had never seen the shadow of a fly rod. Each night at dusk the guests returned to a cobalt lake and a warm hearth where over candlelit dinners they regaled each other with fishing yarns that required no embellishment.

"It's not quite like the old days," I laughed as Ray joined me for dinner.

"No," he smiled. He is a short man, with a kind face, a trim beard, and eyes that sparkle yet remain distant, as if peering somewhere else, a distant horizon or a place in the past where he dared not go.

After dinner I wandered from the lodge across the prairie flat that ran up toward Hotleskiwa Creek and the site of the old camp I had known. Only the tin-lined cache remained, a broken-down platform perched in a copse of spruce above the stream. Still, in the fading light I sensed the presence of old friends, saw in my mind's eye their silhouettes against the canvas of the tents that once lined the bench overlooking the

It's a land where Canada could  
hide England, and the English  
would never find it.





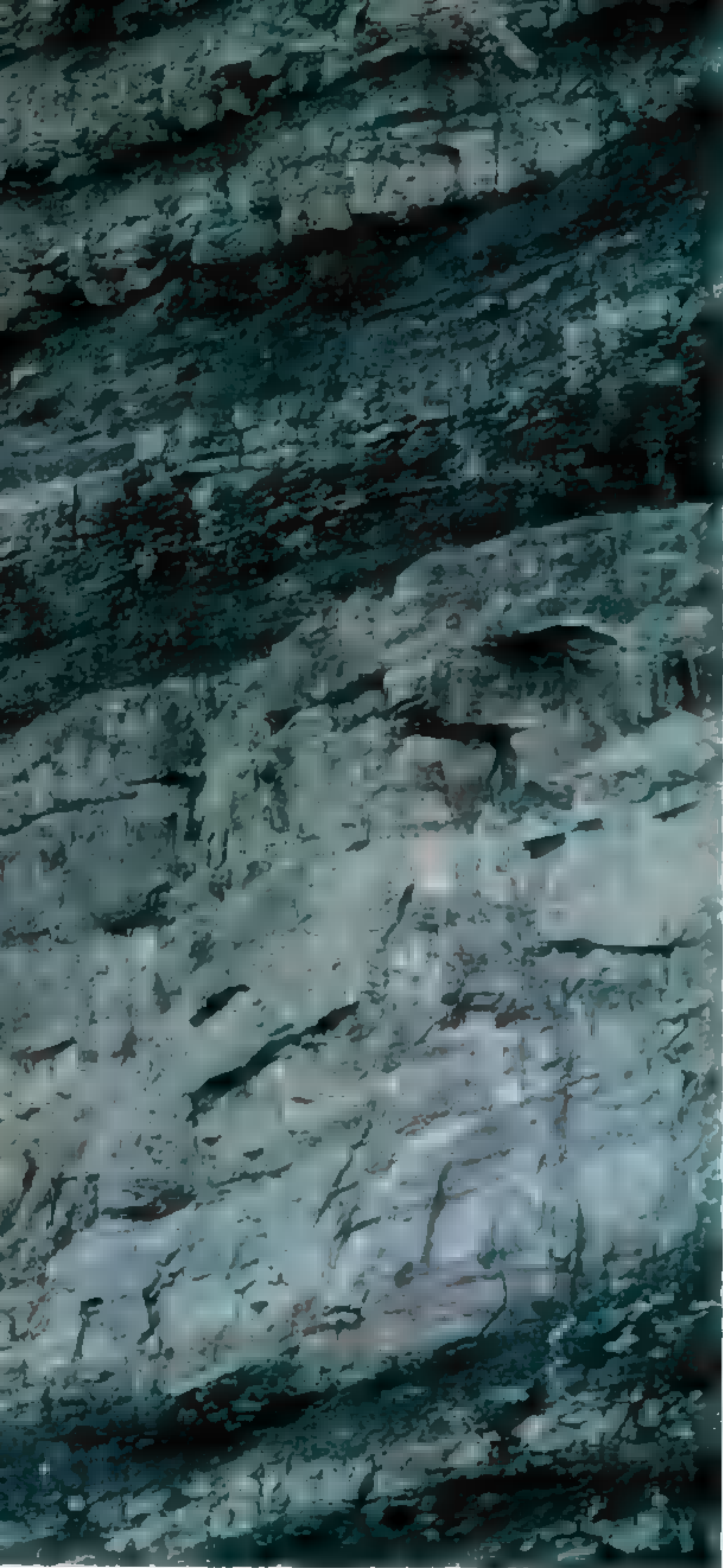
creek. The Collingwoods always hire good and decent people, but the guides today are of a different generation, highly educated like Ray's son Chris and his friend Kent, both veterinarians, and well traveled like Kate, a wrangler who spends her winters backpacking across Africa. In the old days the crew were cowboys, men who lived where their hats fell, rough-cut diamonds who worked the northern hunting camps all fall, drank away their earnings in a weekend, and retreated to the line camps of the Chilcotin River to tend cattle through the long and impossible winters of the southern interior.

Many of them, including a lanky wrangler named Lester Miller, came from Clinton, which

was not an ordinary town. In the 1960s a Vancouver motorcycle gang named Satan's Choice made a habit of roaring into unsuspecting communities, terrifying the local populace, and retreating to the coast. One summer they selected Clinton as a target. Emerging from the old Frontier Hotel, having been thrown out of the bar, they were greeted by a semicircle of rifles, according to Lester. Slack-jawed, they watched in horror as the cowboys blew apart their Harley-Davidsons. To get home, the entire gang had to take a Greyhound bus.

Lester is still going strong, but as I made my way back to the lodge, too many faces came to me of those who had passed on. Guiding on





**On a vertical pitch, a mountain goat safely pauses on a wall of the Stikine's Grand Canyon. Goats can go where wolves cannot, following routes that spiral down canyon walls.**

personal losses and setbacks, freak accidents like the time Ray had his arm broken in 16 places when the prop kicked back on him as he tried to jump start the plane on an autumn morning.

"But then there are those days when you're up on a ridge looking into a basin, and there's a bull caribou over there and a sheep over there, goats up there, and an eagle flying across the sun, and everything is going OK, and you think, This is pretty good. You've got to strive for those good days because life, life is tough, period."

**R**ay and I had one of those good days, and it began in the morning when we flew up the valley to make a delivery to his camp at Buckinghorse Lake, 20 miles west of Laslui. Ray is not one to fly in a straight line if there's a more interesting option, and as his Piper Cub rose like a dragonfly out of the mist, the Spatsizi unfolded below us, and we followed the Stikine to its source. I found myself embracing the landscape from two perspectives. From the air it was a stunningly beautiful mosaic: the fens and meadows at the head of Laslui, the meandering stream draining Tuaton Peak, and the prairie beyond. There the river, a mere brook, carves a serpentine path through a valley of stone and grass that rises toward the Skelhorne Pass and the snowfields on the flank of Mount Umbach where the river is born. All around are soaring massifs, mountains without names, hidden valleys that give rise to so many great rivers, the Skeena, Nass, and Finlay, which is itself the source of the Mackenzie, greatest of all Canadian rivers.

At the same time I knew the land with a startling intimacy. Moose were grazing in meadows where Alex and I had hunted. Goats and sheep frequented ledges and knolls where I had walked. As Ray banked in a steep turn across the flank of Umbach, I remembered the afternoon when I drank from the source, a trickle of water the width of a boot that in time would become a river carving a path through mountains and canyons to the sea. From the Skelhorne we spun west, across the headwaters of the Ross River,

the coast, Jack Cherry took a plane that hit a mountain in the fog. Mike Jones, Ray's closest friend, went through the ice on his trapline, and it was six months before the Mounties could recover the body. Near the lodge I stopped by one of the cabins, a simple log structure elevated to the sublime by a copper plaque on its wall, etched with a poem that remembers Ray's youngest son, Chad, killed in a plane crash that also took down the pilot and his son and two others. Only Ray's daughter, Carrie, survived, cushioned by the family dog that died in her lap, protecting her from the impact.

"It's hard work," Ray's brother Reg said when I asked him how they kept going after so many

where Alex's wife, Madeleine, had wintered as a child, in caribou-hide tents in temperatures so low that breath cracked in the wind. At Klahowya Lake I looked down upon the remnants of one of our old camps, beneath the flank of a ridge where four grizzlies were sleeping in the morning sun.

Ray saw the land not through memories but through the eyes and habits of the animals. A salt lick that drew moose had a pattern different from the one that attracted caribou. A mound of earth camouflaged a den of wolves. And this knowledge was nothing compared with

**“What I wanted was . . .  
a place where dreams  
did not stop at dawn.”**

what he saw in the moment: the flash of a hawk, a wolf pack scattering by a stream, a sow grizzly bolting into the brush, a thousand such sights few others would have seen. But he did, because for 30 years he had made observation his mission, and no matter what else occurred in his life, he was not about to miss a chance to engage the sublime vision of the wild.

After skirting the flank of Tuaton Peak, alive with mountain goats, and making our delivery at Buckinghorse Lake, we flew back to Laslui, where we dragged a white-water raft across the beam of one of his skiffs and set out down the lake toward the outlet at Fountain Rapids. As the lake narrowed, the Stikine slowly took form, its surface dappled by hundreds of whitefish rising to feed. The entire sky was pink, and the air scented with smoke that had drifted thousands of miles from forests burning in Siberia. When the water grew too shallow for the skiff, I cast off in the raft to join a small group of friends camped out below the portage, intent on floating the upper reaches of the Stikine.

“Say hello to Tom,” Ray said as we parted.

**B**efore Tom Buri was a lawyer, he was a pioneer of the primitive. Of the thousands of young people who went back to the land in the 1960s, he was one of the few to choose the Stikine as a destination. His odyssey began one frosty morning on a farm in Vermont when he realized that his flock of sheep, harassed but unharmed by a

pack of wild dogs, had literally died of fright.

“That was it,” he told me as we huddled by a fire just above the roar of the Fountain Rapids. “It was the ultimate proof that domestication had destroyed all instincts, that breeding had left nothing of the spirit. I was living in the Neolithic, gardening. What I wanted was the Paleolithic, a time before civilization had dropped an iron curtain over the imagination, a place where dreams did not stop at dawn.”

To the horror of his wife's father, who told Tom that his debutante daughter was a poodle and not a sled dog, Tom and Deborah embarked on a journey that landed them an hour by boat downstream from Telegraph Creek—the historic center of the Stikine. “We drew a small circle around us, built a home, and created a universe,” said Tom.

They had help, of course, from the Tahltan, especially an elderly couple, Roy and Eva Callbreath. From Eva and other women, Deborah learned to tan moose hides, heal with plants, and put up berries and salmon in the summer, meat in the fall. Roy showed Tom how to work dogs, build sleds, trap, and prepare skins. But above all Roy taught Tom the ways of the animals, the nature of a hunter. When Tom came back one day from a hunting sojourn, he recounted to Roy a curious story. Standing on a rocky bluff perched above a precipitous exposure, he had been suddenly surrounded by ravens, dozens of birds spinning a tighter and tighter spiral just above his head. Tom took it as a spiritual epiphany. Roy just laughed, explaining that what he had experienced was simply the way that ravens kill goats, confusing them until, dizzy with vertigo, they tumble down the canyon walls.

For ten years Tom and Deborah lived by the seasons, cutting wood in the fall, fishing in the spring, raising a family. In August Tom shot a mountain goat, in the fall a stone sheep. Two moose got the family through the winter; a black bear brought variety to the table in the spring.

“Food and heat,” Tom remembered. “That was it. It was a life of wandering and puttering. A free-form drift like berry picking. You forget where you are. You're just following the berries.”

In all his time on the river Tom never explored the Spatsizi, never visited the headwaters, roughly 120 miles east of Telegraph. “When you lived down below Telegraph,” he explained, “the



**Salmon strips hang** in the pungent smokehouse of Henry and Edna Quock at Old Tahltan Village. Tahltan communities come together for the run: the men catching fish and building the houses, the women tending fires and preparing the fish. Henry's brother, Louie (below left), removes a salmon from a gill net. He and his wife set up a seasonal tent camp behind a cabin (below right) at Four Mile, where they smoke and can salmon. Traditionally the Tahltan traded salmon to inland people for moose meat and other staples.





Renaissance woman by necessity, *Nancy Ball cans her own salmon, chops her own*



*firewood, and, in winter, traps wolf, marten, and mink—work she says is “modernized” by her snowmobile.*

upper Stikine was in a sense unthinkable. The canyon was this huge barrier, not just physically but psychologically. It was this place that destroyed any boat that tried to head up into it, this land where even the Tahltan rarely went."

As we talked, it was clear that the Stikine still haunted Tom's imagination, even though it had now been some years since he had got a divorce, moved south to Vancouver, studied law, and started a new family.

"Why did you ever leave the Stikine?" I asked.

Things were beginning to change, he explained. When he had first arrived in 1970 there had been

**"Eventually you end up re-creating Vermont . . . just to stay sane."**

no electricity, only a couple of vehicles and snowmobiles. And there had been space for the newcomers in the lives of the Tahltan. But eventually when 40 families arrived, the largest influx since the gold rush, the young white newcomers began to look and sometimes act like invaders. The community became polarized between whites and natives.

There was something else going on. The journey into the wild is ultimately a journey into the subconscious, and the months of isolation are not without psychological risk. The outsiders most successful at adapting to life in the bush were those who organized themselves methodically, even rigidly, in a regime of the practical and deliberate, with no time for thought or reflection. They created order in the wild.

"Eventually you end up re-creating Vermont in Telegraph just to stay sane. That was the dilemma. As long as I was going in that direction, I decided to go all the way, return to the city, and begin a new life.

"For the Tahltan this was never a problem," Tom said. "They never thought of the Stikine as a wilderness. It was home, and the people carried their culture with them wherever they went."

**T**hat's where my grandmother gave birth," Oscar said, as our helicopter swept over the tundra and rocky escarpments of the Klastline Plateau. To the east in the distance rose the sweeping uplands of the Spatsizi; to the north

was the canyon. But our direction was south and west toward the fire and ice of Edziza, a towering, dormant volcano capped with a glacier eight miles across. It was a foreboding view, even in the soft morning light.

"She had five other kids with her, and she just kept going on the trail."

Oscar Dennis, a Tahltan student of anthropology, and his brother, Murray, and their father, James, had joined me on a survey flight that would carry us in an arc south and then north in a broad sweep up the west side of Edziza. We were looking for the obsidian fields I

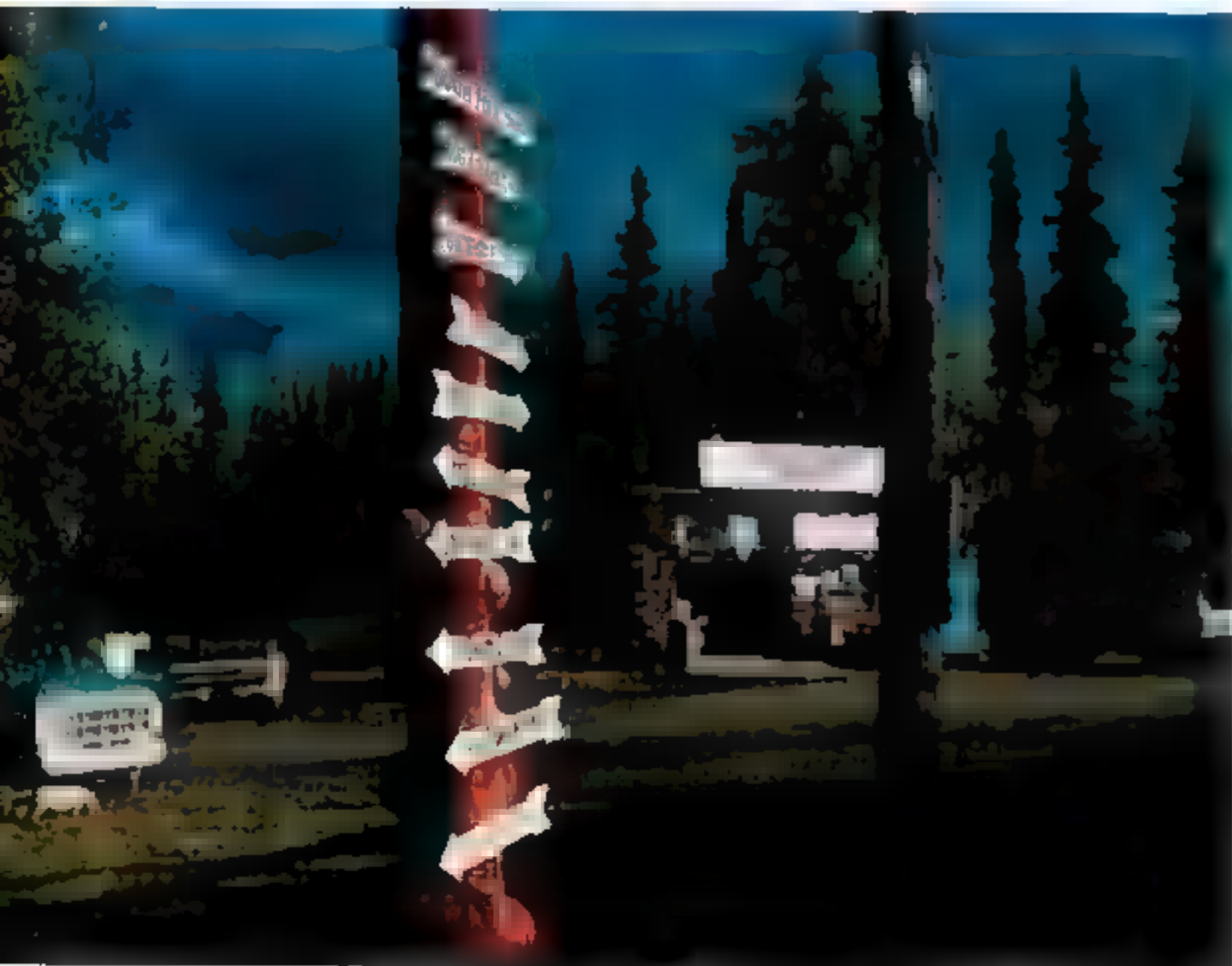
had encountered some years before, when I had walked the length of the massif, a 12-day journey through rugged, imposing terrain. Obsidian is volcanic glass, and a properly chipped arrowhead or scraper has an edge sharper than a razor. Once an important trade item for the Tahltan, obsidian from Edziza has been found throughout western Canada, at sites east of the Rockies and west beyond the Pacific shore on the island homeland of the Haida. Edziza is the mother lode, and there are vast expanses on the high plateau where it is impossible to walk without stepping on shards of what Oscar calls the black blood of the mountain.

None of my companions was especially pleased by our means of transport. Helicopters make James Dennis anxious. His grandfather was sliced in half by a rotor in an accident at a mining camp. Oscar too would have preferred to be on foot. For his ancestors, Edziza was a sacred being that could only be approached by those who had earned the right through ritual purification, celibacy, and daily immersion in cold water for eight months. It is an ancient belief, from the time when the people accepted as a given the mythological account of the victory of Tseskiyesho, Big Raven, who is said to have vanquished the devouring spirit of the mountain and thus freed the people from their fear and misery. Such references are part of Tahltan reality, and they slip in and out of conversations even today.

As a boy, Oscar grew up in the now abandoned mining town of Cassiar, north of the Stikine, where the Indians bagged asbestos and lived apart from the whites in a warren of shacks by the dump. His first home was a tent, but then



**Good fortune smiling on them, Hal and Bunty Althaus celebrate Hal's return home with a bull moose after a fly-in hunting trip. The meat will feed visitors at the resort the couple run at Tatogga Lake, on the region's only highway. They cater to RVs—and fix busted ones at their shop (below left). Two mountain ranges away, horses at Hyland Post are gnat-proofed by smudge fires of sawdust and manure. Outfitter Reg Collingwood was the last to winter horses there, surviving on pancakes with a side of moose.**



**Bald eagles feast** *on smelt where the Stikine claws its way past Alaska's Sergief Island. After 400 miles of fighting for the open sea, the Stikine swirls with memories of death and rebirth.*

an aunt gave his family a house, which for a year was perched on a hillside, at a steep angle, without a foundation. The kids invented a game, opening the front door to any drunk who appeared and then watching as he stumbled downhill and smacked into the opposite wall of the house. School was a series of humiliations, white teachers who beat the native kids with rulers and rods.

His life turned around the night his ex-wife's boyfriend attacked him, and Oscar took a homemade knife in the chest, a six-inch blade buried to the hilt.

"I knew I was in trouble when he twisted it. I pulled it out and it looked all rusted, but it was my blood."

The next thing he remembers is a cold winter sky above the tarmac in Whitehorse as he was evacuated to a hospital in the south. In time Oscar recovered and, with the encouragement of his sister, entered university, where he found in anthropology a context for understanding what had happened to his people.

Low to the ground, with the sun behind us, we scanned the slopes of Edziza for flashes of light, indications of glass. A glint drew the pilot's attention and he swept low over a field of black stones in a braided glacial stream. Setting down, we stumbled out of the chopper. Obsidian was everywhere, crystal stones, boulders three feet across. On the sandy slope above the stream were tens of thousands of shards, worked stone, evidence of an ancient site thousands of years old. We wandered like children, dazzled by each new discovery.

The wind picked up, and I turned to the sky. I knew the power of this mountain. Anything was possible: sudden violent gales in the darkness, a foot of snow on an August day.

Oscar took no notice of the wind. He moved across the rise with the motion of a night cloud. Picking up shards, he spun them in his hand, discarding them with a snap of the wrist. Suddenly he stopped, knelt down, and slowly rose, holding a piece of obsidian to the sun.

"I know how to do this," he said.



Three days later I went to visit Oscar at his brother's place. From a leather pouch he removed his tools, an awl of steel and antler, a block of bone. Then out fell a perfect obsidian blade. I was astonished. It had been generations since a Tahltan had chipped an obsidian tool from glass found on Edziza.

"It's in my blood," Oscar smiled. "That's what my brother says."

I held Oscar's blade in my hand and placed in his hand a tool carved from caribou bone, a gift Alex Jack had given me the summer before he died. Smooth as new ice but stained dark from decades of handling, it fit comfortably in Oscar's grip, the round serrated tip protruding





between finger and thumb. I told him Alex had carved it more than 80 years before, following the lead of his father. It was designed for skinning out the eyelids of wolves.

Every year since those first seasons in the Spatsizi with Alex, the Stikine has called me home. I return for the wild: grizzly bears and white wolves, clouds of cottonwood down, summer snow squalls, and raptors scraping the sky. And I return for the land, and a chance to sit on a high ridge and look in every direction to valleys larger than entire countries.

But mostly I return because the Stikine has become my neighborhood, and I like my neighbors. They have little in common save for

some random mutation in their family pasts that coded for strength and authenticity—and a deep conviction that the Stikine is a paradise that cannot be improved upon. And sometimes I think about the tool Alex gave me, the one used to skin out the eyelids of wolves, and I wonder if the eyelids were not in some way my own. Perhaps Alex, having taught me so much about how to see, was in his own way saying goodbye. □

**WEBSITE EXCLUSIVE** Interested in visiting Deep North?

Find out how ■ get there and where to stay in our Online Extra. And learn more about local residents, including the fellow so filled with gunshot that he jokes about wearing a life jacket to take ■ bath, at [nationalgeographic.com/magazine/0403](http://nationalgeographic.com/magazine/0403).

ZipUSA

TALLADEGA, ALABAMA



# Daily Home

Little things happen in Talladega, Alabama, just like anywhere else. Boys share strategy at track meets; men bike home from factory jobs. Riders grin all the way back to the barn; girls grab their moments to dream. But at Talladega's Alabama Institute for Deaf and Blind, little things can represent big accomplishments. Here, free of charge, deaf and blind Alabamians—like these—prepare to face the seeing, hearing world.

BY MARGARET C. ZACKOWITZ  
NATIONAL GEOGRAPHIC SENIOR WRITER

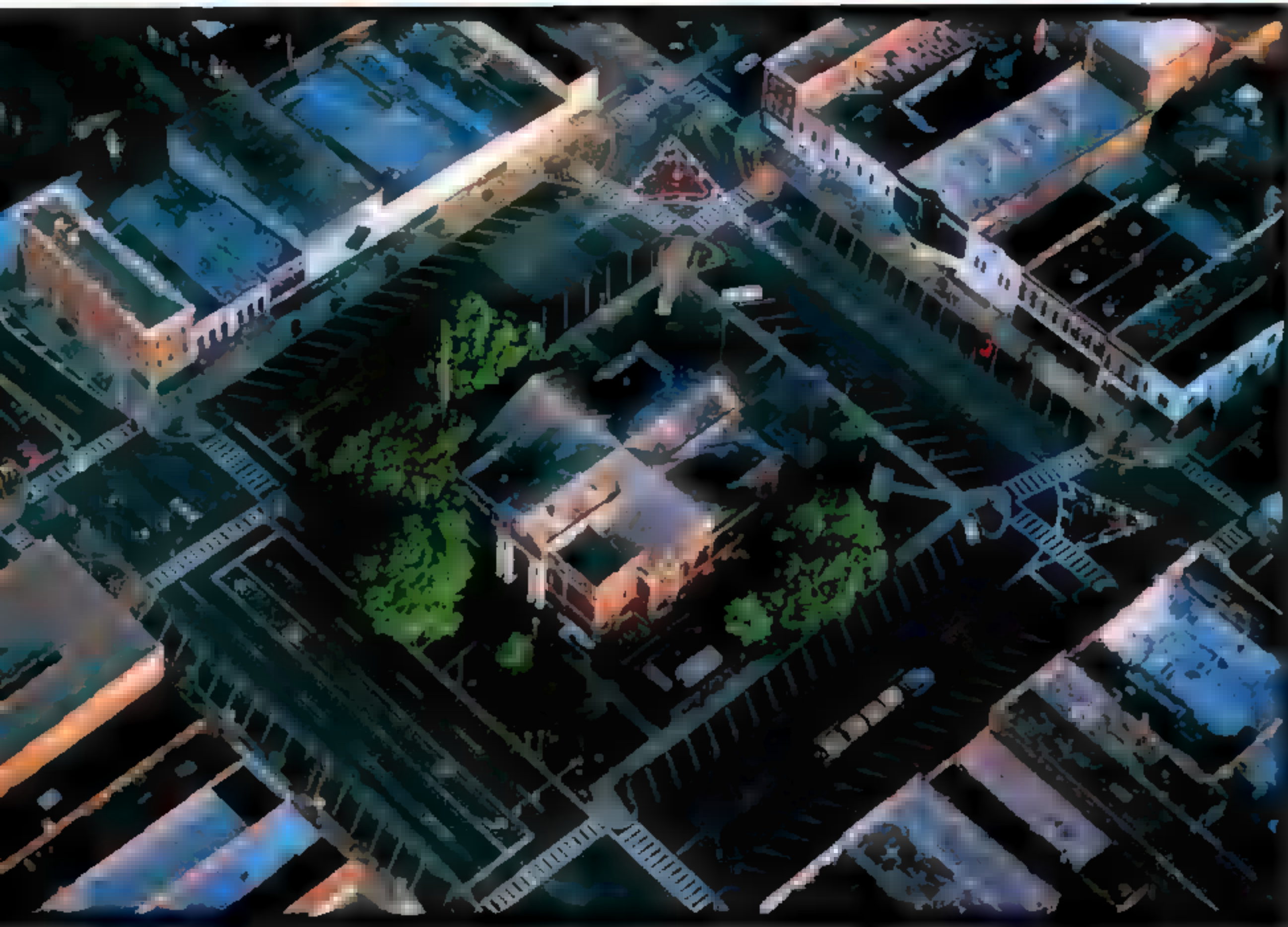
PHOTOGRAPHS BY DAVID MCLAIN



# Free To Be 35160



## TALLADEGA, ALABAMA



Talladega

Montgomery

35160

**POPULATION:**

17,000

**INSTITUTE STAFF:** 1,100

**STUDENTS:** 450

**GOOD SPORTS:** Deaf AIDB athletes have won state and national championships in most sports.

**IN TUNE:** Famous AIDB alumni include the Blind Boys of Alabama gospel group and blues singer Clarence Carter.



If what occupies their roadsides also occupies their minds, then the people of Talladega, Alabama, must be pondering cars and God. Churches and auto repair shops are everywhere in this Bible Belt town, home to NASCAR's biggest, fastest track, the Talladega Superspeedway.

But there's more to Talladega than a fondness for heaven and horsepower. Listen: A talking crosswalk in the square in front of the courthouse says when it's safe to step off the curb. Look: Ladies chatting in a café also absentmindedly speak in sign language. The town post office sells stamp books marked in Braille. And at high school football games, the snap is noted with blows to a bass drum, so deaf players will feel the sound's vibration and know the ball's in play.

What might pass for disability elsewhere can pass here without much notice. That's because for more than a century Talladega has been home to the Alabama Institute for Deaf and Blind, AIDB. Any hearing- or vision-impaired state resident can attend for free, and from age three and up, hundreds do. Many feel so comfortable in Talladega that they stay for the rest of their lives. There's a sense of belonging for the first time. "This place," they'll tell you, "feels like family."

Many leave their real families to attend. Norman Culver, age 56, has been blind from birth. He was six when he came to the Alabama School for the Blind—one of the institute's four academies, along with a school for the deaf, one for children with multiple disabilities, and a trade school for adults. Most students, even the three-year-olds, live in campus dormitories. "My mother and I rode the Trailways bus all the way from Huntsville, 90 miles away," Norman remembers of his arrival. "I didn't know she was going to leave me. She got me to playing with another little boy, and next thing I knew she'd disappeared." Norman learned years later that his mother hadn't left right away. "She watched me for a couple of hours, crying," he says, "before she could turn around and go."

Norman thrived at the school, where he stayed through 12th grade.

The 1836 courthouse (top) sits at the city's center, yet Talladega's true heart is a few blocks away, at the institute often known by its initials: AIDB. An array of help from canes (above) to computers is available to students, but the town does its part too. Textured crosswalks help the blind, and many residents learn sign language to communicate with the deaf.



## Here's our entire Organic Credo: Yum.

Spoon up Kashi's Organic Promise® cereal and you'll taste sun-sweetened berries. Crispy rice. Wholesome wheat. Because that's about all that's in there. We harvest our ingredients at the peak of ripeness for the fullest flavor. And we keep out all chemicals, pesticides and preservatives. Our fruits and grains are all USDA certified organic, but you'll simply certify them delicious.



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## TALLADEGA, ALABAMA

After touring the South as a professional singer (“Music at blind schools,” he says, “is like football everywhere else”), he returned to Talladega for a job at Alabama Industries for the Blind, the institute’s workshop. Now he helps manage the place, which is the second largest employer in Talladega County. Workers here sew almost a million neckties a year, among other items, supplying every neck in the United States military. They also make mops, brooms, cleaning brushes, notebook paper and easel pads, toner cartridges, and American flags. Alabama Industries provides jobs for more than 300 Talladegans, most of them blind or deaf. “Everybody needs work to do,” Norman says. “We’ll modify our machines, we’ll do whatever it takes, to make it possible for people to earn a living.”

The institute began with its School for the Deaf, founded in 1858 by J. H. Johnson, a young physician inspired by Thomas Gallaudet’s pioneering work educating the deaf. Johnson bought a vacant building in Talladega and turned it into a school with a grant from the Alabama State Legislature, which still provides most of AIDB’s funding. Within a year 21 deaf children, including Johnson’s own younger brother, were enrolled. In 1867 the School for the Blind was started. A third academy, for children who are both deaf and blind, opened in 1955. Now known as the Helen Keller School, it also serves children who have additional disabilities, including autism and cerebral palsy.

Today there are about twice as many students at the School for the Deaf than at the School for the Blind, the institute’s two largest academies.

**Role-playing in classes at the School for the Deaf helps young Tabitha Spurling (below) build vocabulary. Off campus (bottom), deaf alumni socialize using American Sign Language, which is taught at the school.**



# “WHO COULD HAVE PREDICTED THIS?”

- METEOROLOGIST, SURPRISED BY THE ENVOY XUV'S POWER-SLIDING REAR ROOF



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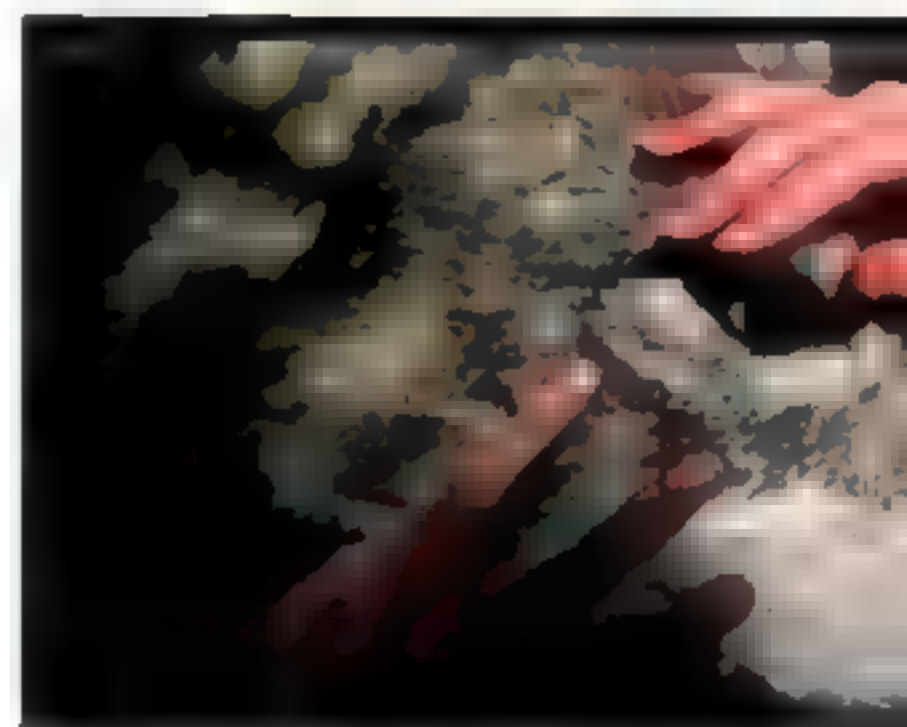
**What might pass for disability elsewhere can pass here without much notice.**

A friendly rivalry exists. “We tend to have more of a sense of humor about ourselves,” insists Jason Martin, a 17-year-old blind student. He and fellow senior Donte Little freely admit that target practice is not the strong point of their ROTC training. “But you can only laugh at yourself if you believe in yourself,” adds the boys’ teacher, Brenda Uptain, whose own vision is impaired. “Self-confidence is one of the most important lessons we teach.”

At AIDB the staff slips in such lessons wherever it can. All blind students receive mobility training to allow them to navigate unfamiliar places using canes. The School for the Deaf’s football team, the Silent Warriors, holds its own against local high schools, and won the Deaf School Football National Championship in 2000, 2001, and 2002. The Marianna Greene Henry Special Equestrians arena—a 47,000-square-foot indoor riding ring—serves some 100 students a week, including many with severe physical disabilities. They improve their flexibility, balance, and coordination with specially supervised horseback riding known as hippotherapy.

“See that girl?” asks Tim Greene, the arena manager. A small group of children from the Helen Keller School, two of them in wheelchairs, has arrived to ride. At the center of the arena, the student Tim points out already sits astride a placid gray pony. She is deaf, and her expression is solemn; plastic braces encase her legs. Volunteer assistants post themselves on either side of the saddle to hold her steady while a physical therapist signs instructions with flying hands. “She wasn’t even walking when she started this program,” says Tim. “Now she can get around with a walker. Other children who’ve never been able to interact well with people all of a sudden start talking to a horse. These kids get more from this than just the exercise.”

And they get more from Talladega than just an education. Out in the dusty riding ring, as if to prove the point, the girl leans forward in her saddle and plants a kiss on the pony’s bristled mane. □



**Deaf, blind, and a great cook, Annie Williams (top), 52, lives independently in her own apartment. AIDB teaches life skills to adults like Annie through in-home visits and classroom instruction. Younger students get a feel for animals (above) at a School for the Blind exhibit. Says teacher Snikka Smothers, “Learning starts in their fingertips.”**

#### WEBSITE EXCLUSIVE

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***There's a different way to treat seasonal allergies.***

**SINGULAIR IS THE ONLY SEASONAL ALLERGY MEDICATION THAT SPECIFICALLY BLOCKS LEUKOTRIENES.** Many existing allergy medicines block histamine. SINGULAIR is different. It works by blocking leukotrienes (loo-koh-TRY-eens). Leukotrienes are an underlying cause of allergy symptoms. They are substances produced in your body that can make you feel uncomfortable during allergy season.

**HELPS RELIEVE A BROAD RANGE OF SYMPTOMS.** A single SINGULAIR tablet ■ day helps relieve ■ broad range of seasonal allergy symptoms for ■ full 24 hours. SINGULAIR ■ also available in ■ cherry chewable tablet for children 2 to 14 years of age. In clinical studies, SINGULAIR was not associated with drowsiness. SINGULAIR should be taken once a day, as prescribed. SINGULAIR is available by prescription only.

**IMPORTANT INFORMATION:** In clinical studies, side effects were usually mild and varied by age, and included headache, ear infection, sore throat, and upper respiratory infection. Side effects generally did not stop patients from taking SINGULAIR. SINGULAIR should not be taken by people who are sensitive to any of its ingredients.

Ask your doctor about SINGULAIR for your seasonal allergies.  
Call 1-888-MERCK-95, or visit [singulair.com](http://singulair.com).

Please see the Patient Product Information on the adjacent page and discuss it with your doctor.



This product is available through the Merck Patient Assistance Program.  
To find out if you qualify call 1-888-MERCK-56.

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*A different way to treat seasonal allergies.*

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**Patient Information**  
**SINGULAIR® (SING-u-lair) Tablets, Chewable Tablets, and Oral Granules**  
**Generic name: montelukast (mon-te-LOO-kast) sodium**

Read this information before you start taking SINGULAIR®. Also, read the leaflet you get each time you refill SINGULAIR, since there may be new information in the leaflet since the last time you saw it. This leaflet does not take the place of talking with your doctor about your medical condition and/or your treatment.

**What is SINGULAIR®?**

- SINGULAIR is a medicine called a leukotriene receptor antagonist. It works by blocking substances in the body called leukotrienes. Blocking leukotrienes improves asthma and seasonal allergic rhinitis (also known as hay fever). SINGULAIR is not a steroid.

SINGULAIR is prescribed for the treatment of asthma and seasonal allergic rhinitis:

**1. Asthma.**

SINGULAIR should be used for the long-term management of asthma in adults and children ages 12 months and older.

**Do not take SINGULAIR for the immediate relief of an asthma attack.** If you get an asthma attack, you should follow the instructions your doctor gave you for treating asthma attacks. (See the end of this leaflet for more information about asthma.)

**2. Seasonal Allergic Rhinitis.**

SINGULAIR is used to help control the symptoms of seasonal allergic rhinitis (sneezing, stuffy nose, runny nose, itching of the nose) in adults and children ages 2 years and older. (See the end of this leaflet for more information about seasonal allergic rhinitis.)

**Who should not take SINGULAIR?**

Do not take SINGULAIR if you are allergic to SINGULAIR or any of its ingredients.

The active ingredient in SINGULAIR is montelukast sodium.

See the end of this leaflet for a list of all the ingredients in SINGULAIR.

**What should I tell my doctor before I start taking SINGULAIR?**

Tell your doctor about:

- **Pregnancy:** If you are pregnant or plan to become pregnant, SINGULAIR may not be right for you.
- **Breast-feeding:** If you are breast-feeding, SINGULAIR may be passed in your milk to your baby. You should consult your doctor before taking SINGULAIR if you are breast-feeding or intend to breast-feed.
- **Medical Problems or Allergies:** Talk about any medical problems or allergies you have now or had in the past.
- **Other Medicines:** Tell your doctor about all the medicines you take, including prescription and non-prescription medicines, and herbal supplements. Some medicines may affect how SINGULAIR works, or SINGULAIR may affect how your other medicines work.

**How should I take SINGULAIR?**

**For adults or children 12 months of age and older with asthma:**

- Take SINGULAIR once a day in the evening.
- Take SINGULAIR every day for as long as your doctor prescribes it, even if you have no asthma symptoms.
- You may take SINGULAIR with food or without food.
- If your asthma symptoms get worse, or if you need to increase the use of your inhaled rescue medicine for asthma attacks, call your doctor right away.
- **Do not take SINGULAIR for the immediate relief of an asthma attack.** If you get an asthma attack, you should follow the instructions your doctor gave you for treating asthma attacks.
- Always have your inhaled rescue medicine for asthma attacks with you.
- Do not stop taking or lower the dose of your other asthma medicines unless your doctor tells you to.
- If your doctor has prescribed a medicine for you to use before exercise, keep using that medicine unless your doctor tells you not to.

**For adults and children 2 years of age and older with seasonal allergic rhinitis:**

- Take SINGULAIR once a day, at about the same time each day.

- Take SINGULAIR every day for as long as your doctor prescribes it.
- You may take SINGULAIR with food or without food.

**How should I give SINGULAIR oral granules to my child?**

Do not open the packet until ready to use.

SINGULAIR 4-mg oral granules can be given either:

- directly in the mouth; OR
- mixed with a spoonful of one of the following soft foods at cold or room temperature: applesauce, mashed carrots, rice, or ice cream. Be sure that the entire dose is mixed with the food and that the child is given the entire spoonful of the mixture right away (within 15 minutes).

**IMPORTANT: Never store any oral granule/food mixture for use at a later time.** Throw away any unused portion.

**Do not put SINGULAIR oral granules in liquid drink.** However, your child may drink liquids after swallowing the SINGULAIR oral granules.

**What is the daily dose of SINGULAIR for asthma or seasonal allergic rhinitis?**

**For Asthma (Take in the evening):**

- One 10-mg tablet for adults and adolescents 15 years of age and older,
- One 5-mg chewable tablet for children 6 to 14 years of age,
- One 4-mg chewable tablet or one packet of 4-mg oral granules for children 2 to 5 years of age, or
- One packet of 4-mg oral granules for children 12 to 23 months of age.

**For Seasonal Allergic Rhinitis (Take at about the same time each day):**

- One 10-mg tablet for adults and adolescents 15 years of age and older,
- One 5-mg chewable tablet for children 6 to 14 years of age, or
- One 4-mg chewable tablet or one packet of 4-mg oral granules for children 2 to 5 years of age.

**What should I avoid while taking SINGULAIR?**

If you have asthma and if your asthma is made worse by aspirin, continue to avoid aspirin or other medicines called non-steroidal anti-inflammatory drugs while taking SINGULAIR.

**What are the possible side effects of SINGULAIR?**

The side effects of SINGULAIR are usually mild, and generally did not cause patients to stop taking their medicine. The side effects in patients treated with SINGULAIR were similar in type and frequency to side effects in patients who were given a placebo (a pill containing no medicine).

The most common side effects with SINGULAIR include:

- stomach pain
- stomach or intestinal upset
- heartburn
- tiredness
- fever
- stuffy nose
- cough
- flu
- upper respiratory infection
- dizziness
- headache
- rash

Less common side effects that have happened with SINGULAIR include (listed alphabetically): agitation including aggressive behavior, allergic reactions (including swelling of the face, lips, tongue, and/or throat, which may cause trouble breathing or swallowing), hives, and itching, bad/vivid dreams, increased bleeding tendency, bruising, diarrhea, hallucinations (seeing things that are not there), hepatitis, indigestion, inflammation of the pancreas, irritability, joint pain, muscle aches and muscle cramps, nausea, palpitations, pins and needles/numbness, restlessness, seizures (convulsions or fits), swelling, trouble sleeping, and vomiting.

Rarely, asthmatic patients taking SINGULAIR have experienced a condition that includes certain symptoms

that do not go away or that get worse. These occur usually, but not always, in patients who were taking steroid pills by mouth for asthma and those steroids were being slowly lowered or stopped. Although SINGULAIR has not been shown to cause this condition, you must tell your doctor right away if you get one or more of these symptoms:

- a feeling of pins and needles or numbness of arms or legs
- a flu-like illness
- rash
- severe inflammation (pain and swelling) of the sinuses (sinusitis)

These are not all the possible side effects of SINGULAIR. For more information ask your doctor or pharmacist.

Talk to your doctor if you think you have side effects from taking SINGULAIR.

**General information about the safe and effective use of SINGULAIR**

Medicines are sometimes prescribed for conditions that are not mentioned in patient information leaflets. Do not use SINGULAIR for a condition for which it was not prescribed. Do not give SINGULAIR to other people even if they have the same symptoms you have. It may harm them. **Keep SINGULAIR and all medicines out of the reach of children.**

Store SINGULAIR at 25°C (77°F). Protect from moisture and light. Store in original package.

This leaflet summarizes information about SINGULAIR. If you would like more information, talk to your doctor. You can ask your pharmacist or doctor for information about SINGULAIR that is written for health professionals.

**What are the ingredients in SINGULAIR?**

Active ingredient: montelukast sodium

**SINGULAIR chewable tablets contain aspartame, a source of phenylalanine.** Phenylketonurics: SINGULAIR 4-mg and 5-mg chewable tablets contain 0.674 and 0.842 mg phenylalanine, respectively.

Inactive ingredients:

- **4-mg oral granules:** mannitol, hydroxypropyl cellulose, and magnesium stearate.
- **4-mg and 5-mg chewable tablets:** mannitol, microcrystalline cellulose, hydroxypropyl cellulose, red ferric oxide, croscarmellose sodium, cherry flavor, aspartame, and magnesium stearate.
- **10-mg tablet:** microcrystalline cellulose, lactose monohydrate, croscarmellose sodium, hydroxypropyl cellulose, magnesium stearate, hydroxypropyl methylcellulose, titanium dioxide, red ferric oxide, yellow ferric oxide, and carnauba wax.

**What is asthma?**

Asthma is a continuing (chronic) inflammation of the bronchial passageways which are the tubes that carry air from outside the body to the lungs.

Symptoms of asthma include:

- coughing
- wheezing
- chest tightness
- shortness of breath

**What is seasonal allergic rhinitis?**

- Seasonal allergic rhinitis, also known as hay fever, is an allergic response caused by pollens from trees, grasses and weeds.
- Symptoms of seasonal allergic rhinitis may include:
  - stuffy, runny, and/or itchy nose
  - sneezing

Rx only

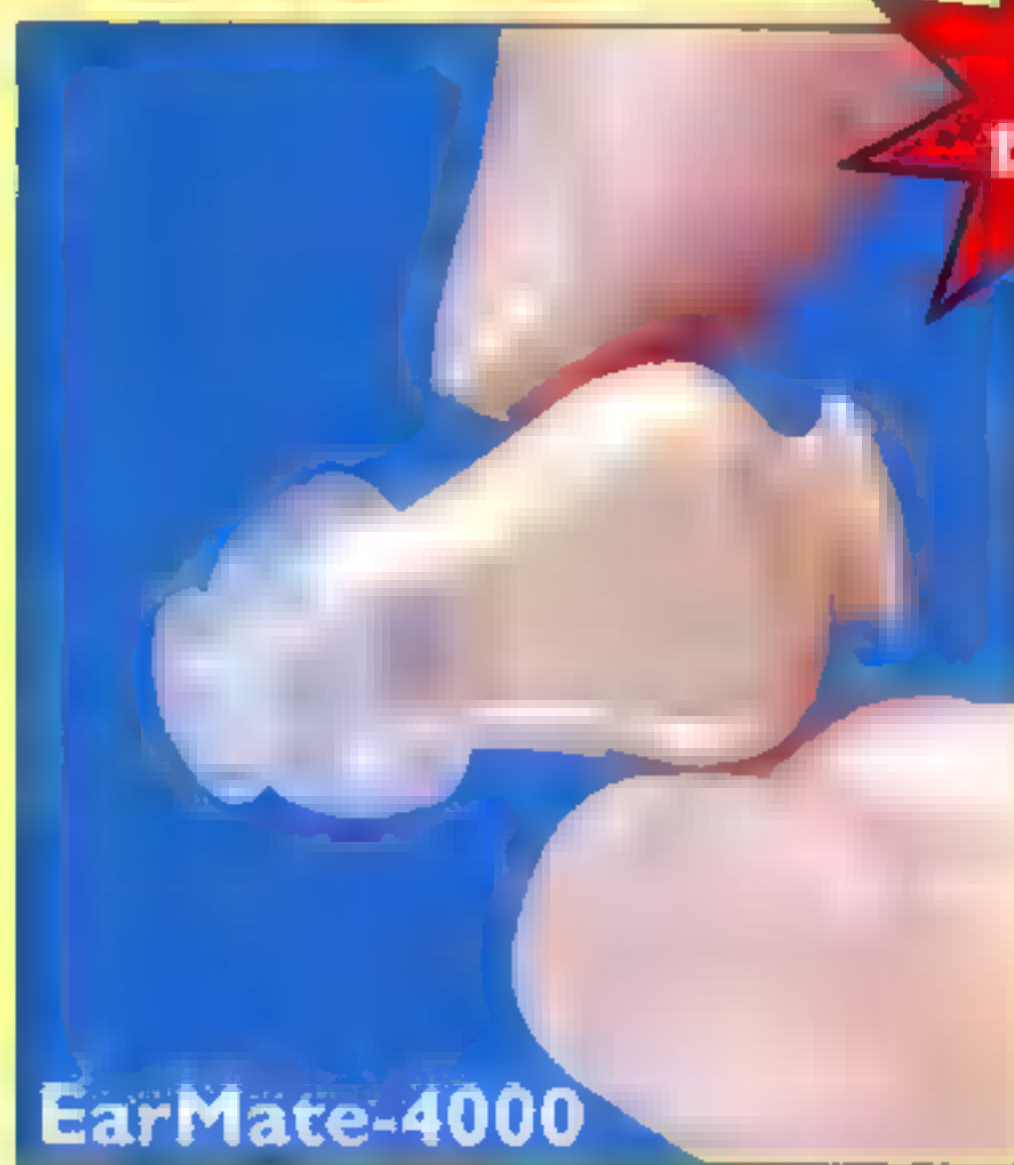
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# Final Edit



SARAH LEEN

## STIKINE RIVER

### Glacial Movement

The dark moraine running down the middle of the rippled Shakes Glacier “leads your eye in a curve, like the center line of a highway,” says picture editor Bert Fox. “It makes you want to spend time with the image.”

But Fox had to move the reader along the entire 400-mile length of the Stikine River, from the plateaus and canyons of its upper reaches to the glacial mountains and wetlands of the lower Stikine—and he had to convey a sense of the people and history that make the river a story unwinding through northwestern Canada.

Despite the rich texture of the photograph and the fact that it was, says Fox, “the strongest image showing glacial flow,” the editors eventually decided on a different shot of glacial geography—the one on pages 104-105. “In the end this one didn’t make it into the layout,” Fox says, “because it didn’t show the Stikine.”

#### WEBSITE EXCLUSIVE

Cut it or keep it? Find out more about what tipped the balance for this photo and send it as an electronic greeting card in Final Edit at [nationalgeographic.com/magazine/0403](http://nationalgeographic.com/magazine/0403).



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HARP SEALS

## Icy Composure

*Photographer learns to go with the floes*

**G**etting under the pack ice in Canada's Gulf of St. Lawrence is easy, says **Brian Skerry**, who photographed harp seals. But wind and currents often conspire to move the huge sheets of ice around, so that "the place you enter may not be the place you exit," he says. Once, as

ice chunks the size of Volkswagens jostled on the surface, he looked up to see the crack he'd come through closing. Luckily a new opening appeared in time for his escape. While water temperatures hovered at freezing on all Brian's dives, he says that was the only time he got the chills.

## STIKINE RIVER

## Canadian Club

It's been 26 years since writer **Wade Davis**, then a park ranger, first met the Iskut First Nations people of the Stikine River Valley—nearly as long as Chief Louis Louie, at left, has been the group's leader. Now Wade, at right, knows the community as neighbors and friends. "These folks have seen my daughters grow up," he says. "They're like family to my kids."

Though he keeps a home base in Washington, D.C., where he is a National Geographic Society explorer-in-residence, Wade, his wife, and their two girls spend every summer in Stikine at the family's rustic fishing lodge. Perched on the edge of a six-mile-long lake, the place makes up in wild beauty what it lacks in electricity and phone lines. The time



SARAH LEEN

the Davis family spends there "is the well we draw on for the rest of the year," says Wade, who was

born in British Columbia. "It's essential that my daughters get that taste of being Canadian."

## WORLDWIDE



JAN FAKULA

**Sarah Leen** had a lot of territory to cover when she was photographing British Columbia's Stikine River. Its watershed is about the size of Switzerland but has only one road. To get around, Sarah says, "it's floatplanes or horses or boats." Or boots: She had to hike a while to approach Great Glacier, the remnant of the river of ice that once covered the

entire basin. At the foot of the glacier, a lake choked with ice proved a good spot for a spin in the inflatable kayak she'd packed along (above). "It's so beautiful there," she says. "Your story is all around you when you're out in the wilderness like that."

"The whole time I was in Talladega I was reminded of the Alabama

town in *To Kill a Mockingbird*," says writer **Maggie Zackowitz**. "I could easily imagine Scout Finch and Boo Radley living in some of the old houses on South Street." Actually, author Harper Lee based the novel's setting on her own Alabama hometown, Monroeville, where she still has a home. But when Maggie saw the name "Lee" in block letters on the outside wall of Talladega's public library, right across from "Bronte," she was sure it was for Harper, instead of the other Lee—Harper's famous ancestor, Robert E. Sure enough, her hunch was confirmed by the town librarian.

**WEBSITE EXCLUSIVE** Find more stories from our authors and photographers, including their best, worst, and quirkiest experiences, at [nationalgeographic.com/magazine/0403](http://nationalgeographic.com/magazine/0403).



A woodpecker with a red crest and black and white body is perched on a black cordless drill battery. The battery has a red label with "18V" and "Li-Ion" printed on it. The background is a warm, orange-toned image of a cordless drill.

Protect his habitat. And yours.

What does a pileated woodpecker and a cordless drill battery have in common? When you recycle your rechargeable batteries, you preserve his environment — and ours. Check the batteries in your other cordless power tools, as well as laptop computers, cordless and cell phones, PDAs, camcorders, and remote control toys. If they no longer hold a charge, recycle them by visiting [www.rbrc.org](http://www.rbrc.org), calling **1-800-8-BATTERY**, or dropping them off at one of these national retailers.

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RBRC Spokesperson Richard Karn,  
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# Flashback



JACOB GAYER

## BRAZIL


### Skirting the Issue

Showing off her slinky style, a woman in São Luís, in northeastern Brazil, poses with the skin of a green anaconda for members of a National Geographic aerial survey team. The story of their expedition, "Skypaths Through Latin America," in the January 1931 *GEOGRAPHIC*, featured a shot of the same snakeskin with the caption, "Anacondas big enough to swallow a calf infest the delta of the Amazon." The world's heaviest snakes, green anacondas weigh as much as 500 pounds and measure nearly 28 feet long. This one—maybe 200 pounds and 16 feet long when it could still slither—was a relative lightweight.

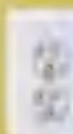
—Margaret G. Zackowitz

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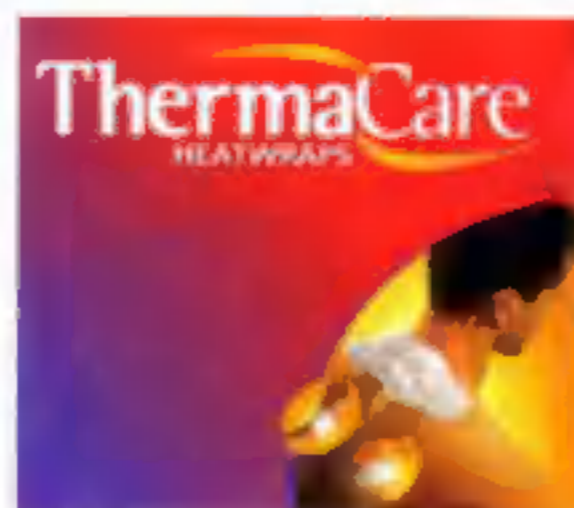


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